



EPA KEY CONTACTS FORM

OMB Number: 2030-0020
Expiration Date: 06/30/2024

Authorized Representative: *Original awards and amendments will be sent to this individual for review and acceptance, unless otherwise indicated.*

Name:	Prefix: Mr.	First Name: Garry	Middle Name: Allan
	Last Name: Harris		Suffix:
Title:	Managing Director		
Complete Address:			
Street1:	100 Flat Shoals Ave		
Street2:	Atlanta		
City:	Atlanta	State:	GA: Georgia
Zip / Postal Code:	30316	Country:	USA: UNITED STATES
Phone Number:	4049369620	Fax Number:	
E-mail Address:	gharris@htsenterprise.com		

Payee: *Individual authorized to accept payments.*

Name:	Prefix:	First Name: Kim	Middle Name:
	Last Name: Burton		Suffix:
Title:	Finance Officer		
Complete Address:			
Street1:	100 Flat Shoals Ave		
Street2:			
City:	Atlanta	State:	GA: Georgia
Zip / Postal Code:	30316	Country:	USA: UNITED STATES
Phone Number:	4049369620	Fax Number:	
E-mail Address:	kburton@csc-atl.org		

Administrative Contact: *Individual from Sponsored Programs Office to contact concerning administrative matters (i.e., indirect cost rate computation, rebudgeting requests etc).*

Name:	Prefix:	First Name: Kayley	Middle Name:
	Last Name: Beard		Suffix:
Title:	Operations and Administrative Director		
Complete Address:			
Street1:	100 Flat Shoals Ave		
Street2:			
City:	Atlanta	State:	GA: Georgia
Zip / Postal Code:	30316	Country:	USA: UNITED STATES
Phone Number:	4049369620	Fax Number:	
E-mail Address:	gharris@htsenterprise.com		

EPA KEY CONTACTS FORM

Project Manager: *Individual responsible for the technical completion of the proposed work.*

Name: Prefix: **First Name:** **Middle Name:**
Last Name: **Suffix:**
Title:

Complete Address:

Street1:
Street2:
City: **State:**
Zip / Postal Code: **Country:**
Phone Number: **Fax Number:**
E-mail Address:

Other Attachment File(s)

* Mandatory Other Attachment Filename:

Add Mandatory Other Attachment

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To add more "Other Attachment" attachments, please use the attachment buttons below.

Add Optional Other Attachment

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Preaward Compliance Review Report for All Applicants and Recipients Requesting EPA Financial Assistance

Note: Read Instructions before completing form.

I. A. Applicant/Recipient (Name, Address, City, State, Zip Code)

Name: Center for Sustainable Communities

Address: 100 Flat Shoals Ave

City: Atlanta

State: GA: Georgia

Zip Code: 30316-1337

B. DUNS No. 969070932

II. Is the applicant currently receiving EPA Assistance? ☐ Yes ☒ No

III. List all civil rights lawsuits and administrative complaints pending against the applicant/recipient that allege discrimination based on race, color, national origin, sex, age, or disability. (Do not include employment complaints not covered by 40 C.F.R. Parts 5 and 7.)

None

IV. List all civil rights lawsuits and administrative complaints decided against the applicant/recipient within the last year that allege discrimination based on race, color, national origin, sex, age, or disability and enclose a copy of all decisions. Please describe all corrective actions taken. (Do not include employment complaints not covered by 40 C.F.R. Parts 5 and 7.)

None

V. List all civil rights compliance reviews of the applicant/recipient conducted by any agency within the last two years and enclose a copy of the review and any decisions, orders, or agreements based on the review. Please describe any corrective action taken. (40 C.F.R. § 7.80(c)(3))

None

VI. Is the applicant requesting EPA assistance for new construction? If no, proceed to VII; if yes, answer (a) and/or (b) below.

☐ Yes ☒ No

a. If the grant is for new construction, will all new facilities or alterations to existing facilities be designed and constructed to be readily accessible to and usable by persons with disabilities? If yes, proceed to VII; if no, proceed to VI(b).

☐ Yes ☒ No

b. If the grant is for new construction and the new facilities or alterations to existing facilities will not be readily accessible to and usable by persons with disabilities, explain how a regulatory exception (40 C.F.R. 7.70) applies.

VII. Does the applicant/recipient provide initial and continuing notice that it does not discriminate on the basis of race, color, national origin, sex, age, or disability in its program or activities? (40 C.F.R. 5.140 and 7.95)

☒ Yes ☐ No

a. Do the methods of notice accommodate those with impaired vision or hearing?

☒ Yes ☐ No

b. Is the notice posted in a prominent place in the applicant's offices or facilities or, for education programs and activities, in appropriate periodicals and other written communications?

☒ Yes ☐ No

c. Does the notice identify a designated civil rights coordinator?

☒ Yes ☐ No

VIII. Does the applicant/recipient maintain demographic data on the race, color, national origin, sex, age, or handicap of the population it serves? (40 C.F.R. 7.85(a))

☒ Yes ☐ No

IX. Does the applicant/recipient have a policy/procedure for providing access to services for persons with limited English proficiency? (40 C.F.R. Part 7, E.O. 13166)

☒ Yes ☐ No

- X. If the applicant is an education program or activity, or has 15 or more employees, has it designated an employee to coordinate its compliance with 40 C.F.R. Parts 5 and 7? Provide the name, title, position, mailing address, e-mail address, fax number, and telephone number of the designated coordinator.

No

- XI. If the applicant is an education program or activity, or has 15 or more employees, has it adopted grievance procedures that assure the prompt and fair resolution of complaints that allege a violation of 40 C.F.R. Parts 5 and 7? Provide a legal citation or Internet Address for, or a copy of, the procedures.

No

For the Applicant/Recipient

I certify that the statements I have made on this form and all attachments thereto are true, accurate and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law. I assure that I will fully comply with all applicable civil rights statutes and EPA regulations.

A. Signature of Authorized Official

Garry A Harris

B. Title of Authorized Official

Managing Director

C. Date

03/24/2022

For the U.S. Environmental Protection Agency

I have reviewed the information provided by the applicant/recipient and hereby certify that the applicant/recipient has submitted all preaward compliance information required by 40 C.F.R. Parts 5 and 7; that based on the information submitted, this application satisfies the preaward provisions of 40 C.F.R. Parts 5 and 7; and that the applicant has given assurance that it will fully comply with all applicable civil rights statutes and EPA regulations.

A. *Signature of Authorized EPA Official

B. Title of Authorized Official

C. Date

*** See Instructions**

Instructions for EPA FORM 4700-4 (Rev. 06/2014)

General. Recipients of Federal financial assistance from the U.S. Environmental Protection Agency must comply with the following statutes and regulations.

Title VI of the Civil Rights Acts of 1964 provides that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. The Act goes on to explain that the statute shall not be construed to authorize action with respect to any employment practice of any employer, employment agency, or labor organization (except where the primary objective of the Federal financial assistance is to provide employment). Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act provides that no person in the United States shall on the ground of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under the Federal Water Pollution Control Act, as amended. Employment discrimination on the basis of sex is prohibited in all such programs or activities. Section 504 of the Rehabilitation Act of 1973 provides that no otherwise qualified individual with a disability in the United States shall solely by reason of disability be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. Employment discrimination on the basis of disability is prohibited in all such programs or activities. The Age Discrimination Act of 1975 provides that no person on the basis of age shall be excluded from participation under any program or activity receiving Federal financial assistance. Employment discrimination is not covered. Age discrimination in employment is prohibited by the Age Discrimination in Employment Act administered by the Equal Employment Opportunity Commission. Title IX of the Education Amendments of 1972 provides that no person in the United States on the basis of sex shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance. Employment discrimination on the basis of sex is prohibited in all such education programs or activities. Note: an education program or activity is not limited to only those conducted by a formal institution. 40 C.F.R. Part 5 implements Title IX of the Education Amendments of 1972. 40 C.F.R. Part 7 implements Title VI of the Civil Rights Act of 1964, Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act, and Section 504 of The Rehabilitation Act of 1973. The Executive Order 13166 (E.O. 13166) entitled; "Improving Access to Services for Persons with Limited English Proficiency" requires Federal agencies work to ensure that recipients of Federal financial assistance provide meaningful access to their LEP applicants and beneficiaries.

Items "Applicant" means any entity that files an application or unsolicited proposal or otherwise requests EPA assistance. 40 C.F.R. §§ 5.105, 7.25. "Recipient" means any entity, other than applicant, which will actually receive EPA assistance. 40 C.F.R. §§ 5.105, 7.25. "Civil rights lawsuits and administrative complaints" means any lawsuit or administrative complaint alleging discrimination on the basis of race, color, national origin, sex, age, or disability pending or decided against the applicant and/or entity which actually benefits from the grant, but excluding employment complaints not covered by 40 C.F.R. Parts 5 and 7. For example, if a city is the named applicant but the grant will actually benefit the Department of Sewage, civil rights lawsuits involving both the city and the Department of Sewage should be listed. "Civil rights compliance review" means any review assessing the applicant's and/or recipient's compliance with laws prohibiting discrimination on the basis of race, color, national origin, sex, age, or disability. Submit this form with the original and required copies of applications, requests for extensions, requests for increase of funds, etc. Updates of information are all that are required after the initial application submission. If any item is not relevant to the project for which assistance is requested, write "NA" for "Not Applicable." In the event applicant is uncertain about how to answer any questions, EPA program officials should be contacted for clarification. * Note: Signature appears in the Approval Section of the EPA Comprehensive Administrative Review For Grants/Cooperative Agreements & Continuation/Supplemental Awards form.

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 02/28/2022

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Air Monitoring	66.034	\$	\$	170,150.00	\$	170,150.00
2.						
3.						
4.						
5. Totals		\$	\$	170,150.00	\$	170,150.00

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SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
	(1)	(2)	(3)	(4)	
	Air Monitoring	N/A	N/A	N/A	
a. Personnel	\$ 49,000.00	\$	\$	\$	\$ 49,000.00
b. Fringe Benefits	0.00				0.00
c. Travel	1,825.00				1,825.00
d. Equipment	0.00				0.00
e. Supplies	12,538.00				12,538.00
f. Contractual	0.00				0.00
g. Construction	0.00				0.00
h. Other	97,951.00				97,951.00
i. Total Direct Charges (sum of 6a-6h)	161,314.00				\$ 161,314.00
j. Indirect Charges	8,836.00				\$ 8,836.00
k. TOTALS (sum of 6i and 6j)	\$ 170,150.00	\$	\$	\$	\$ 170,150.00
7. Program Income	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00

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SECTION C - NON-FEDERAL RESOURCES					
(a) Grant Program		(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8.	Air Monitoring	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00
9.					
10.					
11.					
12. TOTAL (sum of lines 8-11)		\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00

SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$ 170,150.00	\$ 85,075.00	\$ 51,045.00	\$ 17,015.00	\$ 17,015.00
14. Non-Federal	\$				
15. TOTAL (sum of lines 13 and 14)	\$ 170,150.00	\$ 85,075.00	\$ 51,045.00	\$ 17,015.00	\$ 17,015.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT					
(a) Grant Program		FUTURE FUNDING PERIODS (YEARS)			
		(b)First	(c) Second	(d) Third	(e) Fourth
16.	Air Monitoring	\$ 161,101.00	\$ 167,180.00	\$	\$
17.					
18.					
19.					
20. TOTAL (sum of lines 16 - 19)		\$ 161,101.00	\$ 167,180.00	\$	\$

SECTION F - OTHER BUDGET INFORMATION	
21. Direct Charges:	22. Indirect Charges:
23. Remarks:	

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Project Narrative File(s)

* **Mandatory Project Narrative File Filename:**

To add more Project Narrative File attachments, please use the attachment buttons below.

Application for Federal Assistance SF-424

* 1. Type of Submission:

- ☐ Preapplication
☒ Application
☐ Changed/Corrected Application

* 2. Type of Application:

- ☒ New
☐ Continuation
☐ Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received:

03/24/2022

4. Applicant Identifier:

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

GA

8. APPLICANT INFORMATION:

* a. Legal Name:

Center for Sustainable Communities

* b. Employer/Taxpayer Identification Number (EIN/TIN):

452526421

* c. Organizational DUNS:

9690709320000

d. Address:

* Street1:

100 Flat Shoals Ave

Street2:

Atlanta

* City:

Atlanta

County/Parish:

* State:

GA: Georgia

Province:

* Country:

USA: UNITED STATES

* Zip / Postal Code:

30316-1337

e. Organizational Unit:

Department Name:

Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:

Mr.

* First Name:

Garry

Middle Name:

* Last Name:

Harris

Suffix:

Title:

Organizational Affiliation:

Center for Sustainable Communities

* Telephone Number:

4049369620

Fax Number:

* Email:

gharris@htsenterprise.com

Application for Federal Assistance SF-424

* 9. Type of Applicant 1: Select Applicant Type:

N: Nonprofit without 501C3 IRS Status (Other than Institution of Higher Education)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

* 10. Name of Federal Agency:

Environmental Protection Agency

11. Catalog of Federal Domestic Assistance Number:

66.034

CFDA Title:

Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities
Relating to the Clean Air Act

* 12. Funding Opportunity Number:

EPA-OAR-OAQPS-22-01

* Title:

Enhanced Air Quality Monitoring for Communities

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment

Delete Attachment

View Attachment

* 15. Descriptive Title of Applicant's Project:

Monitoring Air Pollution in Underserved South Atlanta(MAP-USA)

Attach supporting documents as specified in agency instructions.

Add Attachments

Delete Attachments

View Attachments

Application for Federal Assistance SF-424**16. Congressional Districts Of:**

* a. Applicant

005

* b. Program/Project

005

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment

Delete Attachment

View Attachment

17. Proposed Project:

* a. Start Date:

09/15/2022

* b. End Date:

09/14/2025

18. Estimated Funding (\$):

* a. Federal	498,401.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	498,401.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.☒ c. Program is not covered by E.O. 12372.*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**☐ Yes☒ No

If "Yes", provide explanation and attach

Add Attachment

Delete Attachment

View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix:

* First Name:

Garry

Middle Name:

* Last Name:

Harris

Suffix:

* Title:

Managing Director

* Telephone Number:

4049369620

Fax Number:

* Email:

gharris@htsenterprise.com

* Signature of Authorized Representative:

Garry A Harris

* Date Signed:

03/24/2022

Center for Sustainable Communities/ECO District Hampton Roads Set A Side Narrative

The Center for Sustainable Communities is a BIPOC founded and led community based and focused organization located both in Atlanta, GA and Hampton Roads, VA. The Center for Sustainable Communities has a long and extensive history of moving communities from striving to thriving based on imperatives of resilience, equity and climate action. The Center for Sustainable Communities is a non-profit organization that advocates for communities in the Southern US through design, development, and deployment of science and technology-based solutions in a number of areas including sustainable transportation, climate, health and wellness, comprehensive community revitalization, pollution mitigation, conservation, economic development, clean energy and energy efficiency, housing justice, youth engagement, STEM education, citizen science, emergency preparedness and restorations, equity, resilience, gender equality, and faith initiatives.

The vision of the Center for Sustainable Communities is to be the leading global provider of engineering, science and technology-based solutions that help communities become greener, cleaner, healthier, safer and more climate resilient through application of proven equity and environmental justice principals. The Center for Sustainable Communities aims to make our world more Equitable, Just, Resilient and Sustainable. In addition, the Center for Sustainable Communities uses a unique approach called JUST Science which utilizes many facets of science, technology and engineering in the deployment of its mission and objectives. In 2021, the Center for Sustainable Communities designed, developed and deployed more than seventy (70) solutions that spanned the gambit of sustainable development including eliminating poverty and homelessness, housing justice, minimizing health disparities, advancing high quality education including STEM, sustainable cities and communities, clean energy for all, gender equity, public safety, just economic development and sustainable wage jobs, climate action, and advancing conservation and reducing air, land and water pollution. One specific example includes the design and operation of the Advanced Atmospheric and Research and Monitoring Station (AARMS) to measure pollution impacts on adjacent lower income communities.

The Center for Sustainable Communities has partnered with cities, counties, municipalities, state government, federal agencies, other NGO's and for-profit companies to help deliver solutions to under-resourced communities in areas including clean energy, energy efficiency, green and high performance buildings, transportation, green spaces, public health, climate and resiliency, community development, health and wellness.

The Center for Sustainable Communities works through a variety of means to deliver solutions to under-resourced communities including community organizing and engagement, technical assistance, project management, program development, research, assessment and evaluation, policy and advocacy, education and training, planning and analysis, design, STEM education, and environmental justice.

At the core of the Center for Sustainable Communities work is equity and environmental justice. The Center for Sustainable Communities has worked to advance, create and sustain twelve (12) different and unique organizations whose mission is to advance environmental justice. These include the US EPA's Environmental Justice Academy; a nine month program to educate cohorts of front line and fence line community members to mitigate challenges in their own community. Another example, the Center for Sustainable Communities currently serves on the Board of Directors for the Virginia Environmental Justice Collaborative where it has helped to grow the collaborative to nearly forty-five (45) members, one of the largest of its kind in the country. The Center for Sustainable Communities currently leads efforts to create the National Environmental Justice Institute in Atlanta, GA., which will serve as a technology based "think tank" to advance equity and environmental justice issues globally. Recently, the Center for Sustainable Communities led an effort in the Elizabeth River Watershed to transform it from one of the most strategic and historic rivers in the country and one that was central to the birth of slavery, into one that is now centered on equity.

The Center for Sustainable Communities is leading a number of projects that embrace environmental justice including the National Environmental Justice Institute; an entity designed for the research and broad application to help front line and fence line communities; and the Justice 40 Climate and Economic Development Tool.

The Center for Sustainable Communities works closely with agencies local, regional and national to provide a broad and comprehensive approach using the latest technology, innovation and state of the art cost effective solutions to mitigate environmental community impacts. Example, the Center for Sustainable Communities works closely with the Department of Commerce and its "The Opportunity Project (TOP)" to develop data science and technology products including those used to measure transportation related air pollution. In another example, the Center for Sustainable Communities is working closely with NOAA, FEMA and related agencies aimed at improving community resilience to climate severe weather impacts by reducing vulnerabilities, risks and hazards through effective programming like Building a Weather Ready Nation for All and EJ Strong Communities Methodology.

The Center for Sustainable Communities helps to deploy a number of measures to bolster communities through its ECO District Model. The ECO District Model has been used nationally as a means to revitalize communities. One example is its ECO District Hampton Roads project. It has successfully designed and developed thirty projects, with nearly two hundred volunteers resulting in ~\$3M dollars in cost equivalent investments.

The Center for Sustainable Communities was also co-author of the NAACP's Guide for meaningful community engagement; a national publication designed to empower communities in the sustainable development process. The Center for Sustainable Communities has worked to create grassroots, community-based movements for change in climate, energy democracy and maintenance of our natural resources

The Center for Sustainable Communities partners with many organization to carry out its mission and work including EPA; CDC; Emory University; University of Georgia; 100 Black Men of Atlanta; South Face Energy Institute; Southeast Energy Efficiency Alliance; Southern Alliance for Clean Energy; Southern Environmental Law Center; Georgia Watch; Sierra Club; Arthur Blank Foundation; Office of Emergency Management; FEMA; NOAA; The Weather Channel; Georgia Environmental Justice Alliance; Leadership Atlanta; Institute for Georgia Environmental Leadership; Regional Leadership Institute; Georgia Institute of Technology; Georgia STEAM Alliance; Thriving Exchange; and Georgia Tech's Serve Learn and Sustain Program, among others.

STATE OF GEORGIA

Secretary of State

Corporations Division

315 West Tower

#2 Martin Luther King, Jr. Dr.

Atlanta, Georgia 30334-1530

CERTIFICATE OF INCORPORATION

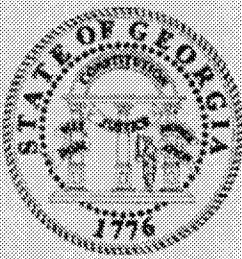
I, **Brian P. Kemp**, the Secretary of State and the Corporations Commissioner of the State of Georgia, hereby certify under the seal of my office that

**CENTER FOR SUSTAINABLE COMMUNITIES,
INC.**

a Domestic Non-Profit Corporation

has been duly incorporated under the laws of the State of Georgia on **05/14/2011** by the filing of articles of incorporation in the Office of the Secretary of State and by the paying of fees as provided by Title 14 of the Official Code of Georgia Annotated.

WITNESS my hand and official seal in the City of Atlanta
and the State of Georgia on May 14, 2011



A handwritten signature in black ink, appearing to read "B: P. Kemp".

Brian P. Kemp
Secretary of State

Quality Assurance Project Plan (QAPP)

Summary


Herein are described the management activities, including planning, implementation, and assessment necessary to ensure the quality and defensibility of the air monitoring data that is proposed to be collected in this project. This section also describes the persons and procedures that will be involved in assuring the quality of data, including: A) the lay and expert technical members that are part of the MAP-USA team; B) instructions from the sensor manufacturer; C) guidance outlined in the Standard Operating Procedures (SOP) obtained from the US EPA, and D) additional assistance from the Ambient Monitoring Program of the Georgia Environmental Protection Division. The team further recognizes that a more detailed *Quality Assurance Project Plan* will be required should an award be made.

Quality Management, Planning, and Implementation

While the entire team is committed to assuring the quality of the air pollution data to be collected, the project manager and project technician share primary and daily responsibility for implementing the QAPP. They will report to the Project Leader and consult and receive feedback from other expert members of the team.

The objectives of the project include the establishment of a network of low-cost sensors to measure the concentration of PM_{2.5} in and around the southern half of the Atlanta urban core. This will “mirror” the already established network of PM_{2.5} sensors in the northern half of the region. While the whole metro area includes four monitoring sites that use approved Federal Reference (FRM) or Federal Equivalent Methods (FEM) and are managed by air quality professionals at the Georgia Environmental Protection Division, most of the monitors deployed in the north Atlanta pollution network are the same kind of low-cost sensors that will be used here. The use of these same sensor devices provides continuity between the new network in South Atlanta with the existing network in North Atlanta.

The EPA’s RFA for Enhanced Air Quality Monitoring for Communities (EPA-OAR-OAQPS-22-01) states that “applicants should use commercially available technology and/or proven methods to monitor ...air pollutants.” Considering this requirement along with availability, cost, quality, and the technical capabilities of the community-based team, MAP-USA will use *PurpleAir PA-II-SD* air quality sensors to measure the hourly concentration of PM_{2.5} pollution. These small, low-cost, and low-power sensors have been used widely in residential, commercial, and industrial applications. They use a built-in WiFi capability to transmit data to the PurpleAir map (professionally managed by PurpleAir), where it is stored and made publicly available to any smart device. In addition, raw air quality data is stored on a built-in 16GB micro-SD card. The sensors come “factory calibrated” and are warranted for 1-year.

 PurpleAir PA-II-SD (w/ power supply)	Dimensions	3.5 in x 3.5 in x 5 in (including mounting bracket)
	Power Demand	5V USB Micro, 0.18A continuous, 600mA peak
	Pollutants Measured	Particle sizes 0.3, 0.5, 1, 2.5, 5, and 10 µm
	Reporting Interval	120 seconds
	Range (PM_{2.5})	0 to 500 µg/m ³
	Max error (PM_{2.5})	±10% at 100 to 500µg/m ³ & ±10µg/m ³ at 0 to 100µg/m ³
	Data Storage	Purpleair.com (WiFi) & locally w/ 16GB micro-SD card

These sensors will be deployed at the selected monitoring sites using the extensive instructions provided by the manufacturer (<https://community.purpleair.com/t/sensor-start-up-guide>) and following the US EPA’s *Standard Operating Procedure for the Purple Air PA-II-SD PM Sensor* guidelines (SOP ID: J-AMCD-SFSB-SOP-3561-3, Effective Date: Jan 8, 2020).

Additionally, in the first year, one sensor will be co-located at the Atlanta metro area South Dekalb air quality monitoring station with the help of the Georgia Environmental Protection Division (see included letter of commitment). At this station, the GA EPD operates an FEM monitor for measuring hourly and daily 24-hour average PM_{2.5} concentrations (Teledyne T640/T640X). Measurements from the low-cost sensor will be compared to this professionally managed monitor and used to assess the accuracy and sensitivity of the sensor, and to provide context about the performance of the larger MAP-USA network. Finally, the budget also provides for the purchase of 11 additional sensors beyond the 10 sensors to be used in the MAP-USA network and the one additional sensor to be co-located at the GA EPD station. In the first 3 months of the project, one additional monitor will be co-located at each of the 11 school monitoring sites. This will allow the team to assess the ability of the sensors to measure pollutant concentrations consistently. During the remaining 33 months, these extra monitors will be available to the teachers and student interns at the partner schools to conduct special pollutant monitoring investigations (e.g., inside school buildings or near roadways) as described in the project description and will be available as “spares” in case any of the 11 main community-based sensors fails.

Quality Assessment / Control

The project technician will maintain a field notebook marked in black ink with all records of sensor deployment, start-up, shut-down, data transfer, and maintenance activities. Field notes will include observations about nearby or transient pollution sources, weather or special events, instrument operation, location, device ID, date and time, and observer(s) name(s). These notes will be maintained for the lifetime of the project.

The manufacturer recommends no maintenance during the life of the sensors, and the sensors are calibrated at the factory and require no additional adjustments in the field. Nonetheless, the operation of the sensors can be affected by numerous conditions such as insects or other animals, harsh weather, and power and communications failures that disrupt normal operations. The technician will be responsible for checking daily, via the PurpleAir Map website, that each sensor is reporting data. Any interruptions in reporting will be noted and will initiate further investigations to rectify operations. The minimum goal is to exceed the 75% uptime benchmark that the US EPA requires for FEM and FRM monitoring. The technician will further visit each sensor site once per month to ensure that the sensor continues to be mounted and operating correctly.

Data from the monitors will be uploaded to the PurpleAir Map database at 2-minute intervals via Wifi and made to be publicly accessible. The PurpleAir Map site includes features that allow users to view and download real-time data as well as aggregates of 10-min, 30-min, 1-hr, 6-hr, 1-day, and 1-week averages. Additionally, the sensor’s raw data will be recorded locally on the included 16GB SD card and manually downloaded to the project laptop once per month and archived (via cloud storage, CD, etc.).

Raw data files will not be edited. Any files that contain any analyses will be saved into a different file with a new name and all analyses will be recorded into the field notebook. At a minimum, the recovered data files will be reviewed to look for data gaps and deviations from the expected data files structure (missing lines, columns, or cells within the data file). Unexplained data gaps and deviations will be investigated and troubleshooting procedures implemented, where possible. Unexpected or unusually high or low data values will be flagged and further investigated. Across the network, data collected concurrently by co-located sensors will be intercompared and variations will be used to estimate the uncertainty in the sensors to measure pollutant concentrations. All efforts will be recorded in the field notebook and procedures will be updated as necessary to eliminate data loss or errors.

Manifest for Grant Application # GRANT13579861

Grant Application XML file (total 1):

1. GrantApplication.xml. (size 26139 bytes)

Forms Included in Zip File(total 6):

1. Form ProjectNarrativeAttachments_1_2-V1.2.pdf (size 16129 bytes)

2. Form SF424_3_0-V3.0.pdf (size 24082 bytes)

3. Form SF424A-V1.0.pdf (size 22866 bytes)

4. Form EPA4700_4_3_0-V3.0.pdf (size 22639 bytes)

5. Form OtherNarrativeAttachments_1_2-V1.2.pdf (size 15909 bytes)

6. Form EPA_KeyContacts_2_0-V2.0.pdf (size 37293 bytes)

Attachments Included in Zip File (total 6):

1. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1236-Attachment C - Community-based Organization Documentation.pdf application/pdf (size 115842 bytes)

2. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1237-Attachment D - Partnership Letters - All.pdf application/pdf (size 833367 bytes)

3. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1235-Attachment B - Proof of Non-profit Status.pdf application/pdf (size 233369 bytes)

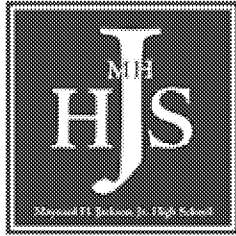
4. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1238-Attachment E - Resumes of Key Personnel.pdf application/pdf (size 1670996 bytes)

5. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1239-Project Narrative - MAP-USA Center for Sustainable Communities.pdf application/pdf (size 950417 bytes)

6. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1234-Attachment A - Quality Assurance Statement.pdf application/pdf (size 193434 bytes)

Partnership Letters in support of the project entitled:
Monitoring Air Pollution in Underserved South Atlanta (MAP-USA)

As proposed by:
the Center for Sustainable Communities



ATLANTA
PUBLIC
SCHOOLS

March 8, 2022

Mr. Garry Harris
Center for Sustainable Communities
100 Flatshoals Ave SE
Atlanta, GA 30316-1337

Dear Mr. Harris:

Maynard Jackson High School is pleased to partner with you and the Center for Sustainable Communities (CSC) to increase the number of air quality monitors in underserved areas around Atlanta. In your proposal, the existing federal and state air quality monitoring networks, and newly emerging private air quality monitoring networks fail to include many parts of the region in which a disproportionate number of minorities and economically disadvantaged persons live. Your attention to this inequitable distribution of air quality monitors will be invaluable in helping to understand the impacts of air quality on all persons living, working, and playing in these regions, and provide the necessary data to advocate for and for more people to participate in the development of solutions.

As a partner with the Center for Sustainable Communities on this effort, Maynard Jackson High School pledges to work with the CSC to expeditiously find a suitable location for hosting a monitor within our community. Considering the need for safe and secure access, availability of power and wifi, and the proper siting of air quality monitors in accordance with standard scientific practices, we will provide your team with the opportunity to set up the monitor and to maintain its operation for a minimum of three years. We further accept your invitation to participate more directly in your program through the Student Internships, Community Science Partnerships, and the air quality GIS analyses and training plans that are part of this effort.

Maynard H. Jackson High School is a high school of approximately 1,500 students. Jackson High is in southeast Atlanta, Georgia, United States along the Beltline in Grant Park, just south of I-20. The school is a part of Atlanta Public Schools. We have a planted rooftop and an organic community garden on the roof. Andrea Stephens is the teacher liaison for the garden.

On behalf of Mayard Jackson High School, I look forward to working with you and your team to bring additional resources and attention to this very important topic of air quality in Atlanta's underserved communities.

Sincerely,

Andrea Stephens
Maynard H. Jackson High School
Science Department

801 Glenwood Ave. SE
Atlanta GA 30316
404-797-8555 (cell)
404-802-5200 (P)
amstephens@apsk12.org
astephensscience@gmail.com

March 16, 2022

Mr. Garry Harris
Center for Sustainable Communities
100 Flatshoals Ave SE
Atlanta, GA 30316-1337

Dear Mr. Harris:

Frederick Douglass High School is pleased to partner with you and the Center for Sustainable Communities (CSC) to increase the number of air quality monitors in underserved areas around Atlanta. In your proposal, it is clear that the existing federal and state air quality monitoring networks and newly emerging private air quality monitoring networks fail to adequately include many parts of the region in which a disproportionate number of minorities and economically disadvantaged persons live. Your attention to this inequitable distribution of air quality monitors will be invaluable in helping to understand the impacts of air quality on all persons living, working, and playing in these regions, and provide the necessary data to advocate for and for more people to participate in the development of solutions.

As a partner with the Center for Sustainable Communities on this effort, the Frederick Douglass High School pledges to work with the CSC to expeditiously find a suitable location for hosting a monitor within our community. Considering the need for safe and secure access, availability of power and wifi, and the proper siting of air quality monitors in accordance with standard scientific practices, we will provide your team with the opportunity to set up the monitor and to maintain its operation for a minimum of three years. We accept your invitation to participate more directly in your program through the Student Internships, Community Science Partnerships, and the air quality GIS analyses and training plans that are part of this effort.

Frederick Douglass High School is located in the northwest of Atlanta, Georgia, and has a population of 1070 students. The current student demographics are 0.1% Asian/Pacific Islander, 95.7% Black, 3.3% Hispanic, and 0.5% Multiracial, 0.4% White, 100% Economically Disadvantaged, 2.0% English Learners and 17.1% Student with Disability. Douglass High School has a school-wide Title I program and serves students in the: Gifted and Talented; English for Speakers of Other Languages (ESOL); Program for Exceptional Children (PEC); and the Remedial Education Program (REP). The school's STEM/STEAM program's mission focuses on student-centered investigative learning, providing collaborative experiences that motivate all students to become producers. The program offers a rigorous and technologically enhanced curriculum that inspires creative, critical, and analytical thinking to prepare students to become STEAM college career ready.

On behalf of Frederick Douglass High School, I look forward to working with you and your team to bring additional resources and attention to this critical topic of air quality in Atlanta's underserved communities.

Professionally,

Dr. Sakia T Franklin-Jones
STEAM Coordinator/Signature Program Specialist

Robert Hairston
Science Master Teacher Leader



Richard E. Dunn, Director

Air Protection Branch

4244 International Parkway
Suite 120
Atlanta, Georgia 30354
404-363-7000

March 23, 2022

Mr. Garry Harris
Center for Sustainable Communities
100 Flatshoals Ave SE
Atlanta, GA 30316-1337

Dear Mr. Harris:

The Georgia Environmental Protection Division, Air Protection Branch, Ambient Monitoring Program would be pleased to assist you and the Center for Sustainable Communities (CSC) on your proposed project to increase the number of air quality monitors in underserved areas around Atlanta. Specifically, we can work with your team to collocate a PurpleAir PM_{2.5} sensor at our South DeKalb monitoring station, so that you may intercompare that low-cost sensor with our more sophisticated monitor: a Teledyne T640X Federal Equivalence Monitor (FEM) for measuring hourly fine particulate (PM_{2.5}) and daily 24-hour average PM_{2.5} concentrations.

We look forward to working with the CSC on this endeavor.

Sincerely,

A handwritten signature in black ink that reads "Karen Hays". The signature is written in a cursive, flowing style.

Karen D. Hays, P.E.
Chief, Air Protection Branch
Georgia Environmental Protection Division

KH:do

Project Title: Monitoring Air Pollution in Underserved South Atlanta (MAP-USA)

Applicant Information: Center for Sustainable Communities; 100 Flats Shoals Ave SE, Atlanta, GA 30316-1337; Mr. Garry Harris (Founder and President), 404-936-0620, gharris@csc-atl.org; DUNS: 969070932.

Set-Aside: Community-based organization set-aside. The Center for Sustainable Communities (CSC) is a minority-led nonprofit community-based organization in Atlanta, Georgia that provides a broad range of services to transition communities based on equity, resilience, and climate action to achieve district-scale sustainability. In this proposal, the CSC addresses the need for air quality monitoring in the southern half of Atlanta's urban core, a relatively poor, majority non-white region with a legacy of industry and transportation corridors near schools and residential communities.

Brief Description of Applicant Organization: The Center for Sustainable Communities is a non-profit organization based in Atlanta, Georgia that advocates for communities in the Southern US through design, development, and deployment of science and technology-based solutions in a number of areas including sustainable transportation, climate, health and wellness, comprehensive community revitalization, pollution mitigation, conservation, economic development, clean energy and energy efficiency, housing justice, youth engagement, STEM education, citizen science, emergency preparedness and restorations, equity, resilience, gender equality, and faith initiatives. The CSC is a recognized leader in the community for its use of community science, and for its STEM education initiatives and teacher development programs at the pre-k through college levels. In 2021, the CSC completed 70 equity-centered solutions in underserved communities, including in South Atlanta.

Project Partner(s): A team of experts from Georgia Tech, a Tier-1 research university located in Atlanta, Georgia (contact: Dr. Dylan Brewer, brewer@gatech.edu, (404) 894-3938) will partner with CSC and contribute to tasks involving community economic, education, and health equity, air quality, spatial analytics and visualization, and curriculum development. This project will also engage the Georgia Environmental Protection Division and 11 public schools in the region identified later in this proposal.

Project Location: This project targets the following communities in the regions in and around south Atlanta, Georgia: City of Atlanta (zip codes: 30314, 30316, 30318, 30331, and 30344), City of College Park (30349), Unincorporated Ellenwood (30058), and City of Jonesboro (30236).

Air Pollutant Scope: PM2.5 using commercially available sensors (Purple Air PA-II-SD).

Budget Summary:

EPA Funding Requested	Total Project Cost
\$498,401	\$498,401

Project Period: September 15, 2022 to September 14, 2025 (36 months).

Short Project Description: MAP-USA will deploy commercially available PM2.5 sensors in 11 minority communities located in the region of South Atlanta, Georgia. Partnering with public schools, the monitors will be in areas where there is heightened concern over potential health impacts due to the proximity of these neighborhoods to heavily traveled transportation corridors, and for which there is no existing air quality monitoring capability. A non-profit organization with experience in managing community-based environmental and science and technology projects in Atlanta will lead the project with the assistance of experts at a Tier-1 research university that is anchored in the local community. The project will also develop leadership and analytical capacity in the community through technical training and the development of lesson plans that will be used with students at the schools where the monitors are located. The objective is to empower these under-resourced communities to collect, analyze, and use the data to draw conclusions related to the causes and effects of air quality.

Section 1 – Project Summary and Approach

A. Overall Project

The Center for Sustainable Communities (CSC) proposes to operate a network of air quality monitors at eleven public schools located in under-resourced neighborhoods on the south side of Atlanta, Georgia. The CSC, supported by experts at the Georgia Institute of Technology, will also develop leadership and analytical capacity in the community through technical training and education programs that will be co-developed with the teachers and delivered to the students at the schools where the monitors are located. The objective is to empower these underserved communities to collect data AND use it to draw conclusions related to the causes and effects of poor air quality.

This project, entitled “Monitoring Air Pollution in Underserved South Atlanta (MAP-USA),” will focus on measuring fine particle pollution (PM_{2.5}) in the local communities described in Section 1B and in partnership with the schools identified in Section 2A. The impetus for the focus on PM_{2.5} is fivefold: 1) PM_{2.5} is a widely pervasive pollutant that can cause significant health impacts; 2) Even in areas that meet the current National Ambient Air Quality Standard (NAAQS) for PM_{2.5}, there can be wide variations in exposure to PM_{2.5} due to proximity to sources such as roadways, and commercial and industrial facilities; 3) Likewise, due to compounding disparities of health, race, socioeconomic, housing, and occupational factors, outcomes related to PM_{2.5} exposure can also vary widely within a population; 4) PM_{2.5} may be a useful proxy for other environmental hazards within a community (e.g., air toxics); and 5) Commercially available sensors for measuring PM_{2.5} are relatively inexpensive, easy to install and maintain, and are well suited for use by “non-experts.” (See the appended Quality Assurance Project Plan for technical details regarding the proposed monitoring of PM_{2.5}.)

Spatially, the Atlanta, Georgia region is divided into a northern half and southern half that is bisected by the East-West transect of Interstate I-20. The communities of the northern half are characterized as relatively prosperous and majority white, and the southern half are noted as being poor and majority non-white. The southern half of the city is also distinguished by the prevalence of industries and transportation corridors in closer proximity to schools and residential communities, likely a legacy of past racial bias in land-use planning,¹ and the paradoxical absence of public and private air quality monitors – especially in comparison to the north that has more than a dozen PM_{2.5} monitors.

Within the South Atlanta region, monitors will be placed at 11 high schools identified with majority nonwhite students and students receiving free or reduced-price lunch. In addition, 6 of the schools that were selected are located within 500 meters of an interstate highway and are matched to 5 similar high schools more than 1000 meters from an interstate. This valuable data will allow the CSC and the South Atlanta community, with the aid of researchers at Georgia Tech, to examine the effect of the interstate highway on ambient air quality, and if the past legacy of redlining in South Atlanta may be continuing to be a cause of present-day environmental injustices. Concurrently, teachers will work with education specialists from Georgia Tech to develop curriculum and tools that will allow students at each school to learn about air quality and understand its causes and effects. This includes providing each school with one additional monitor with which teachers and students can design and conduct their own experiments looking at particle pollution and how it varies depending on multiple factors, e.g., indoor vs. outdoor or near a roadway vs. in a park.

¹ Lane, H.M., R. Morello-Frosch, J.D. Marshall, and J.S. Apte; Historical Redlining Is Associated with Present-Day Air Pollution Disparities in U.S. Cities; *Environ. Sci. Technol. Lett.* 2022; Online Publication Date: March 9, 2022; <https://doi.org/10.1021/acs.estlett.1c01012>

B. Project Significance

This proposal addresses the need for air quality monitoring in the underserved communities in South Atlanta, Georgia. Nested within a large metropolitan area of almost 6 million people, more than one-million people reside in the metro area's urban core consisting of the City of Atlanta and its several neighboring communities. Spatially, the core region is divided into northern and southern halves by the

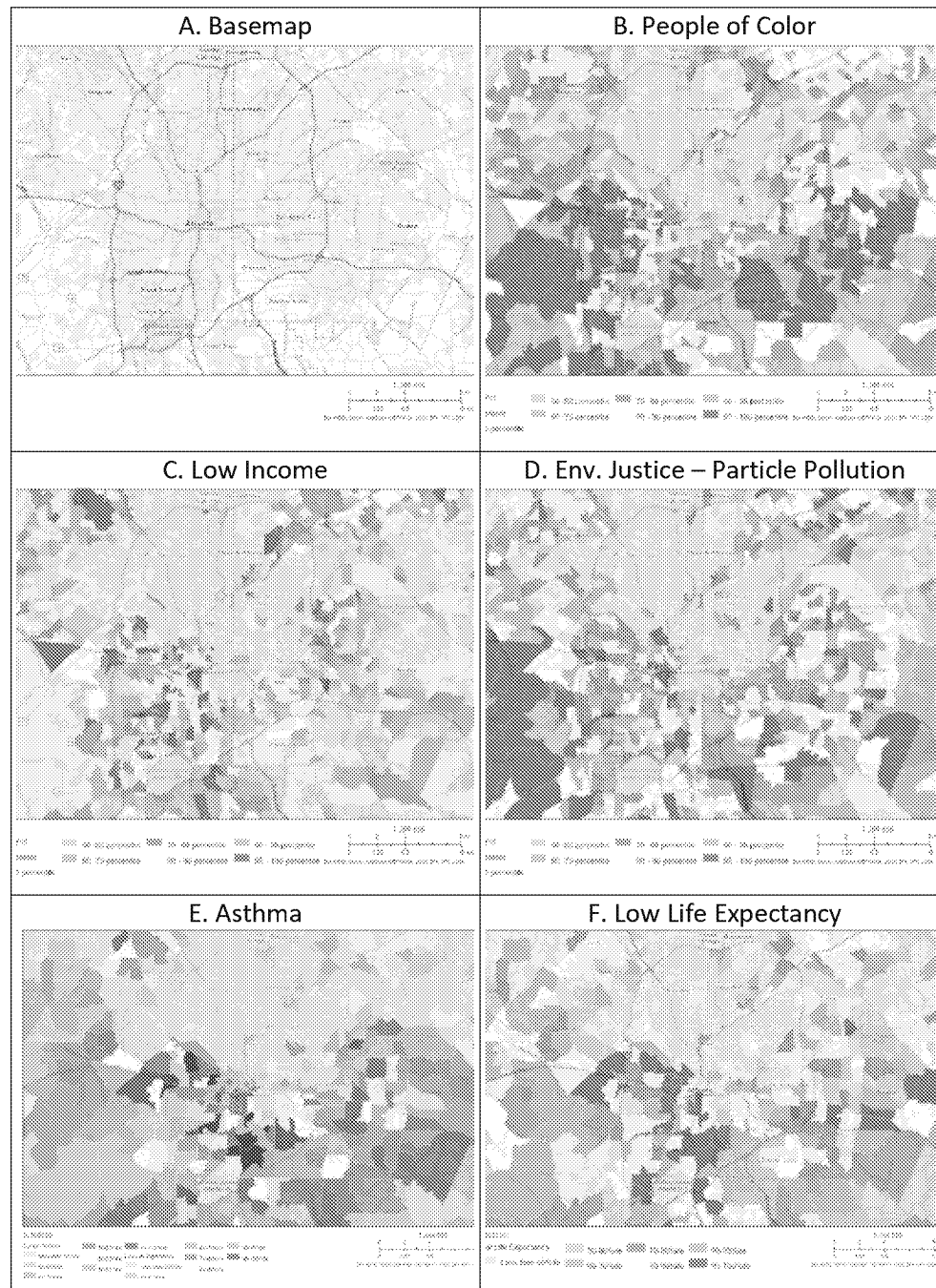


Figure 1. Spatial analysis of metro Atlanta urban core region using US EPA's Environmental Justice Screening and Mapping Tool (EJScreen Version 2.0, <https://ejscreen.epa.gov>; accessed 2-24-2022): A) Basemap, B) People of Color, C) Low Income, D) Environmental Justice Index based on exposure to PM2.5 particle pollution, E) Disparity in Asthma, and F) Disparity in Life Expectancy. Note the dichotomy between the northern and southern halves of the region.

East-West transect of Interstate I-20. The northern half is relatively prosperous and majority white, and the southern half is relatively poor, majority non-white, and subject to additional health disparities. See Figure 1. Further, recent studies of the southside have connected past bias in real-estate lending practices (a.k.a. "redlining") as a potential cause of these current disparities in air quality and health outcomes that have left a persistent legacy of environmental injustice. See Figure 2. It is in this context, then, that it is remarkable to find that the southern half of the Atlanta urban region is also distinguished by the absence of any public and private air quality monitors, and for which this project will fill the gap. See Figure 3.

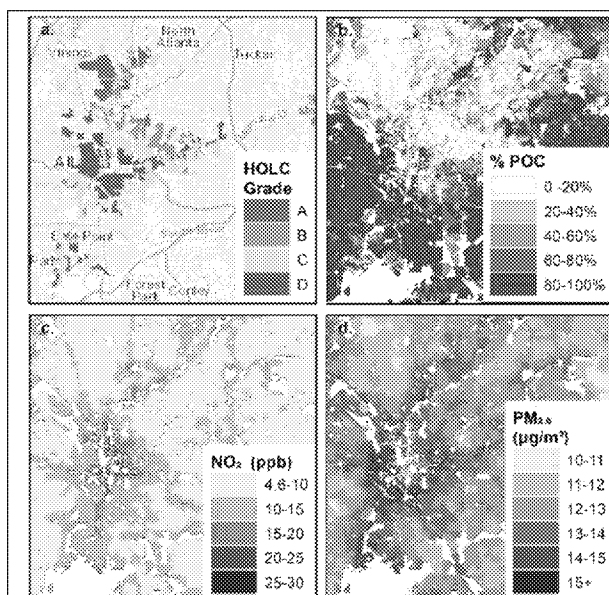


Figure 2. Reproduced from Lane, H.M., R. Morello-Frosch, J.D. Marshall, and J.S. Apte; *Historical Redlining Is Associated with Present-Day Air Pollution Disparities in U.S. Cities*; *Environ. Sci. Technol. Lett.* 2022; Online Publication Date: March 9, 2022. Figure shows maps of the Atlanta area for (a) 1930s Home Owners' Loan Corporation classification on a scale of A (most favorable) to D (least favorable) perceived favorability for home lending; (b) Prevalence of People of Color (POC) in 2010 by census blocks; (c) Modeled NO₂ concentrations in 2010; and (d) Modeled PM_{2.5} concentrations in 2010. Note variations in each figure moving from north Atlanta to the south Atlanta.

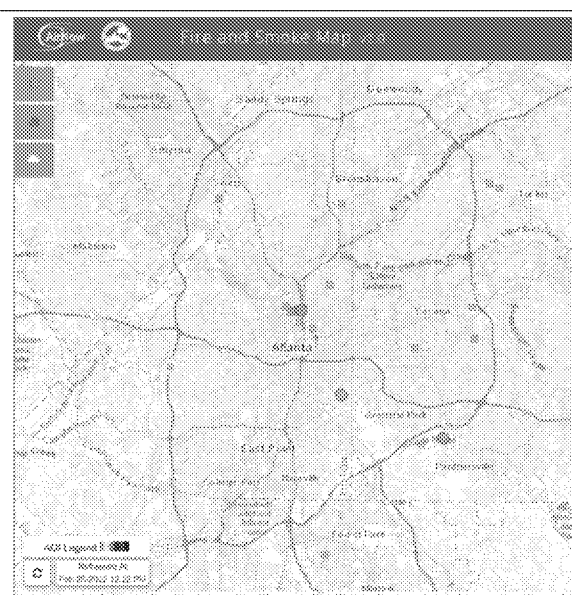


Figure 3. Location of continuous hourly PM_{2.5} monitors in the urban core of metropolitan Atlanta with publicly available data. Note the lack of monitoring south of downtown Atlanta.

● – Permanent monitor (Georgia EPD), and
■ – Low Cost Sensor (Purple Air)

Source – US EPA AirNow Fire and Smoke Interactive Map v2.0 (<https://fire.airnow.gov/>), accessed 2-25-2022.

Section 2 – Community Involvement

A. Community Partnerships

The Center for Sustainable Communities (CSC) is a minority-founded and minority-led, non-profit community-based organization in Atlanta whose mission is to aid in the identification and remedy of environmental justice challenges in under-resourced communities. For this project, it will leverage its history of being a catalyst for sustainable development and empowerment and build on its relationships with educators in the region to create and operate a PM_{2.5} monitoring network for South Atlanta. As the attached letters of commitment show, the CSC has already begun reaching out to some of the proposed schools where PM_{2.5} sensors in South Atlanta will be located and have received enthusiastic response. Over the next few months, the CSC will continue to work on securing commitments from the remaining proposed school partners for which there was not enough time before this proposal was submitted for the full school approval process to be completed. The CSC will also leverage past efforts at creating environmental school curricula to facilitate the introduction of air quality, visualization, and spatial analytics educational programming, developed by Georgia Tech, that is intended to increase technical knowledge and analytical capacity via the students residing in those communities.

Overall, MAP-USA will be led by Mr. Garry Harris, Managing Director for the Center for Sustainable Communities. Through the CSC and other efforts, Mr. Harris has been a visible and engaged leader and participant on a number of local, regional, and national equity and environmental justice initiatives that

use science, engineering and technology including the Advanced Atmospheric Research and Monitoring Station, the NAACP Climate and Energy Justice Leadership Initiative, the NAACP Centering Equity in the Sustainable Building Sector Initiative, the Justice 40 Climate and Economic Justice Tool, the Justice 40 Data Science Collaborative Center for Data Excellence; The US Dept. of Commerce's Opportunity Project, and the DOE NREL's Energy Equity Tool Development. Two staff from the CSC (TBD), under the guidance of Mr. Harris, will serve as the MAP-USA Project Manager and Technician.

Professor Dylan Brewer will serve as the lead for the partners at Georgia Tech from his faculty position in the School of Economics. In addition to his lead management role, he and Economics Professors Daniel Dench and Laura Taylor, along with one graduate student, will oversee the design of the network and subsequent data analyses. As a committee, they will be trusted to ensure the relevancy of the enhanced monitoring effort to serve the needs of the underserved and underrepresented communities, to be scientifically rigorous, and to be analytically sound. Under the direction of Mr. Kevin Caravati, Mr. Matthew Swarts and Ms. Soniya Bhagat in the Georgia Tech Research Institute, with the help of Garry Harris and the teachers at the target schools, will lead the effort to develop grade-appropriate and Georgia Standards of Excellence compliant lesson plans, which are further described below. Finally, Dr. Michael Chang, an atmospheric scientist in Georgia Tech's Brook Byers Institute for Sustainable Systems, will advise the team on matters related to air pollution monitoring, quality assurance, and data analysis.

The team will partner with 11 public high schools located on the southside of Atlanta. These schools were carefully selected to (a) be geographically distributed across the region, (b) cover South Atlanta with PurpleAir sensors at a density that is similar to the PurpleAir network operating in North Atlanta, (c) be located in minority and poor neighborhoods that have been traditionally underserved, and (d) meet the scientific objective of being controlled pairs that differ in their proximity to the interstate to test the effect of redlining on air quality. The targeted schools and their student profiles are shown in Table 1. The location of the schools and their relation to the existing PM2.5 monitoring network in Atlanta is shown in Figure 4. The team has begun reaching out to the schools and some have responded with letters of commitment (included as attachments; additional commitments are still being pursued).

Table 1. School demographics from Urban Institute's Education Data Explorer (<https://educationdata.urban.org/data-explorer>).

School	# Students	% Nonwhite	% Hispanic	% Black	% Reduced lunch	Match pairs
Douglass HS	1059	1.00	0.05	0.95	0.79	A
Mays HS	1256	1.00	0.06	0.93	0.79	A
Booker T. Washington HS	741	1.00	0.02	0.97	0.79	A
Maynard Jackson HS	1361	0.87	0.06	0.77	0.79	B
Cedar Grove HS	1088	0.99	0.03	0.94	0.99	B
Mount Zion HS	1296	0.98	0.21	0.71	0.93	C
Jonesboro HS	1385	0.97	0.21	0.69	0.93	C
Martha Ellen Stilwell School for Performing Arts	576	0.97	0.12	0.77	0.93	D
Elite Scholars Academy	686	0.99	0.16	0.70	0.93	D
Hapeville Charter Career	597	0.98	0.10	0.87	0.62	E
Fulton Leadership Academy	298	1.00	0.03	0.95	0.61	E

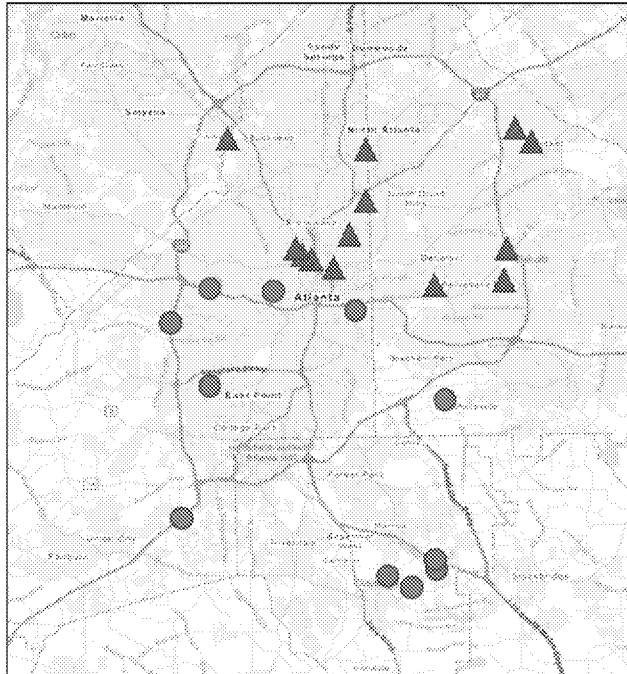


Figure 4. Location of existing PurpleAir monitoring network (▲) and schools where MAP-USA will add monitors (●)

B. Community Engagement

At each school, one science educator or other teacher will be recruited to help site the monitors and maintain their operation. These MAP-USA teaching fellows will also be provided training on acquiring and analyzing air quality data, and help in developing lesson plans that are relevant to the Georgia Standards of Excellence science curriculum to use in their classes.

Teachers participating in the program will be compensated at a rate of \$1000/year. Participant costs also include stipends to fund up to 100 students per year (@\$250 per student per year) to serve as interns learning to operate air quality monitors, quality assure the data, and conduct analyses. The intent with the large student internship program is to develop a deep pool of residents with knowledge, awareness, and capability around the topic of air quality in these underserved communities. Student interns will be recruited and managed by the teachers. In

addition to the one permanent monitor that will be installed and put into operation for the duration of the MAP-USA program, one additional monitor will be provided to each school so that the teachers and students may devise their own air pollutant monitoring programs and to conduct their own experiments (e.g., comparing indoor air quality to outdoor air quality). This will further strengthen their understanding and commitment. Mr. Garry Harris of the CSC will coordinate the school programs and develop opportunities (e.g., by creating an annual MAP-USA School Summit) for the teachers and students at the different schools to further communicate and collaborate with each other and with local air quality professionals and activists, further strengthening and empowering the network.

All data collected through the MAP-USA air quality monitoring network will be freely and immediately available in near-real-time via the PurpleAir.com website. For all users, there is no cost to access the data, nor any requirement to register with the site. Through the analytical tools and curriculum provided to the MAP-USA teaching fellows, all the air quality data collected through the network along with additional data that is relevant for understanding air quality in the context of other factors (e.g., the location of roadways or industrial facilities in relation to the schools, or weather conditions at the concurrent time of an air quality data point) will also be made available.

One of the most engaging capabilities of MAP-USA is to help the next generation of leaders in the community understand how to use geospatial information systems (GIS) to allow the visualization of large air quality data sets on an interactive map. This enables individuals to easily comprehend and relate to the information presented. It is not enough to simply set up a network of monitors and to begin collecting data. For impoverished communities, air quality may not be their first concern and their inattention to it is compounded by its ubiquitous-hiding-in-plain-site nature, its mysterious causes and effects, and highly variable qualities. More than providing monitors where there once were none, MAP-USA strives to invest effort to help these communities understand the data and its implications. Training in GIS based tools also provide a unique skillset that expand opportunities beyond air quality.

The focus of teacher and student programs will be the GIS story map. The GIS story map accomplishes two main objectives: 1) communicating the air quality story of the local community and 2) teaching basic concepts about GIS mapping. The story map begins with an introduction to the community project description highlighting statistics and maps. It is presented as a step-by-step tutorial so that anyone can easily follow problem solving steps to learn how to read a map and perform basic analysis, while gaining knowledge of the community air quality story. Important indicators to include along with air quality data are demographic information (race, income level, education level), hazardous waste/pollution sites, roadways, and housing and energy burdens. The story map ends with a call to engage with local community organizations and provide resources to further study mapping tools. This includes several mapping tools developed by the EPA, such as the EPA EJScreen or EnviroAtlas tools, and community organizations, such as the CSC, Metro Community Ministries in College Park, GA, or the Southern Environmental Law Center in Atlanta.

C. Community-Based Organization Set-Aside

MAP-USA is headed by an experienced BIPOC led community-focused organization with extensive experience in community-based science projects. The Center for Sustainable Communities' engagement practices are grounded in the principles of community organization including fairness, empowerment, participation, and self-determination. It is further backed by a strong science team from a leading technical research university that is deeply rooted in the Atlanta community. A more complete description of the Center for Sustainable Communities is attached as part of the required "Community-based Organization Documentation."

Section 3 – Environmental Justice and Underserved Communities

It is worth reiterating briefly that the objective of MAP-USA is to provide much needed air quality monitoring AND the capacity to understand and interpret air quality data in the poor and minority communities of South Atlanta, Georgia. Up to now, these communities have endured a long legacy of environmental injustices that include centuries old real-estate lending practices that limited where people-of-color could live; disparities in health and access to health care; higher pollutant exposures; and paradoxically, no air quality monitors in close proximity despite overwhelming evidence of need and vulnerability. Reviewers are reminded to see Figures 1 – 4 again, and carefully read the captions. Beyond the air quality data that will be generated through MAP-USA and shared with the community, the project seeks to develop community "ownership" of the community's airshed and the capacity to fully understand why it is, how it can be managed, and that members of the community can, and should, be meaningfully involved in its care (i.e., the development, implementation, and enforcement of environmental laws, regulations, and policies).

Section 4 – Outcomes, Outputs, and Performance Measures

A. Expected Project Outputs and Outcomes

#	Expected Project Outputs	Related Outcomes
1	Deploy PurpleAir sensors to 11 underserved communities in South Atlanta	Increase access to tools for understanding and reducing environmental and health risks
2	Democratize access to real-time air quality data for communities and stakeholders	Increase access to information for understanding and reducing environmental and health risks
3	Identify air pollution problems in underserved communities	Problem identification, encourage community-based and local or state policy action
4	Develop and support education resources and curricula for schools and communities	Increased community awareness, increased access to environmental health information

5	Recruit and retain 10 teacher fellows and enroll 100 student interns yearly	Increased community awareness, encourage community-based and local or state policy action
6	Develop and publish annual community-specific assessments of air pollution data	Increased community awareness, encourage community-based and local or state policy action
7	Produce action plan for addressing disparities in pollution	Encourage community-based and local or state policy action, reduce human air pollution exposure
8	Create partnerships among communities, schools, NGOs, and universities	Promote and initiate community action to mitigate air pollution
9	Quarterly progress reports to EPA	<i>Grant reporting requirement</i>
10	Final report to EPA	<i>Grant reporting requirement</i>

Monitoring network: The installation of the MAP-USA sensor network (#1) will increase access to tools that increase understanding and reduction of environmental and human health risks for eleven communities in South Atlanta. Each sensor will be located at a school with a large share of nonwhite students and students participating in the reduced or free lunch program, which ensures that the sensors will be located in communities of need and provides a platform for community engagement.

Data and community access: Every 2-minutes, data from the monitors is auto-uploaded to the PurpleAir Map via Wifi and made freely and publicly accessible (#2). This democratizes data access for all and increases understanding and reduction of environmental and human health risks. These data will allow everyone the ability to monitor and identify PM2.5 pollution problems (#3). Given the conspicuous lack of pollution sensors in the southern half of Atlanta, these sensors will be key to identifying unaddressed disparities in exposures and pollution hotspots, and lays the foundation for taking action.

Educational outreach: Teachers, student interns, and curriculum development: The CSC will lead development of an educational outreach program with the aid of Georgia Tech expertise in geospatial data representation. The team will develop curriculum and data visualization tools to teach at high schools using the MAP-USA data (#4). In addition, CSC will recruit 10 teaching fellows 100 student interns, and retain their engagement with a yearly stipend (#5). The goal of the educational outreach program is to build the necessary skills for community members to interact with, analyze, and understand air quality data, and thus enabling the communities to care for their own air quality.

Analyses: Community-specific assessment, long-term action plan: The team will provide annual community assessments of air pollution using data from the MAP-USA network (#6). CSC will partner with researchers at Georgia Tech to create reports of PM2.5 concentrations at the monitoring sites with easy-to-understand infographics and bulleted facts that can be shared with community members and policymakers. These assessments will increase community awareness of environmental exposures and will encourage community-based and local or state policy action. Additionally, at the end of the project, CSC and Georgia Tech will produce an action plan for addressing disparities in pollution identified by the MAP-USA network (#7). The action plan will provide steps to reduce emissions and to limit exposures.

Partnerships: The active partnerships created in MAP-USA among local communities, schools, the CSC, and Georgia Tech (#8) will increase the likelihood of concrete progress toward environmental health and justice goals at all levels. This project and its partners are uniquely positioned to connect stakeholders at all levels with disadvantaged communities in Atlanta, which should lead to more collaborations.

Quarterly and final reports to EPA: Quarterly progress and one final report will be provided to the EPA in compliance with reporting requirements (#9-10). The quarterly reports will summarize progress during the last quarter, planned activities for the next quarter, and a summary of expenditures. The final report will discuss the problems, successes, and lessons learned from the project that could help overcome structural, organizational or technical obstacles to implementing a similar project elsewhere.

B. Performance Measures and Plan

Program success begins with the acquisition and deployment of air quality sensors at the 11 MAP-USA schools and is measured by the number of monitors operating and the % time in which each monitor reports valid data. For the latter, the minimum benchmark for performance is 75%, which is the same requirement as for FEM/FRM monitoring. A monthly report of these metrics will be prepared by the attending technician, and included in each quarterly report. Further details about monitoring network performance are described in the attached *Quality Assurance Project Plan*. For the education programs, the recruitment and retention rates of the teacher fellows and student interns are evidence of continued community engagement. These metrics will be reported in the quarterly reports. To measure the impact of the educational curriculum, investigators at Georgia Tech will track its use in classes, and given that the learning modules will be computer based, will develop short online quizzes that students can take as they begin and complete different modules that indicate their level of learning.

C. Timeline and Milestones

Action	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Procure monitors												
Prepare school monitoring sites												
Fully Operating Monitoring Network												
Recruit Teaching Fellows												
Develop/Revise Curriculum												
Recruit Student Interns												
Implement Curriculum in Classes												
Quarterly Report												
Final Report												

Section 5 – Quality Assurance Statement

Please see the 2-page Quality Assurance Project Plan (QAPP) attached separately. The QAPP considers the limitations of using low-cost air quality sensors and the limited technical capabilities of the community-based organization, and provides guidance, Standard Operating Procedures, and methods for assessing the accuracy of the measurements to ensure success.

Section 6 – Programmatic Capability and Past Performance

The Center for Sustainable Communities has a long history of performance in both federal and non-federal grant work. The most recent effort is described here.

A. Past Performance

Title of Project: JUST Science for Underserved Communities; **Sponsor:** NASA Space Grant; **Period of Performance:** 6/1/2018—3/1/2022; **Total Amount:** \$200,000; **Summary of Deliverables:** Provided community-based science education, analytical tools, and awareness building for mitigating air pollution and other environmental injustices. Directed workshops on the use of tools including MyNASAData and EJ Screen. Held workshops for teachers on using GLOBE protocols and hosted the GLOBE Southeast Regional Student Research Symposium. Created the JUST Science Earth Science Consortium, with researchers and teachers to further investigate use of NASA earth science data. Co-Developed the Virginia Environmental Justice Mapping Tool. Conducted classroom training for EPA's Environmental Justice Academy with front line and fence line community residents. Conducted environmental science classroom and field investigations for students in 100 Black Men of Atlanta Project Success Program.

B. Reporting Requirements

The team exceeded the NASA Space Grant requirement to report annually on the series of community-based actions described above by also providing frequent status and project updates to the sponsor.

C. Staff Expertise

For this project, the team at the CSC consisted of five experts in the field of science, education, research and environmental justice. Many of the team members hold advance degrees and one held a doctorate and was a senior level university administrator and academic dean. The Team also consisted of students and faculty from a Tier-1 research university, and was supported by well-established administrative services including financial management and accounting, reporting, and legal and computing services.

Section 7 – Budget

A. Budget Detail

A detailed budget broken out by funding type is shown for a prime award to the Center for Sustainable Communities in Table 2. The budget includes a \$198,401 subaward through the CSC to the Georgia Tech Research Corporation (described further below). Total project costs are \$498,401.

Table 2. MAP-USA Prime Detailed Budget.

Line Item & Itemized Cost	EPA Funding
A. Personnel	
(1) Program Leader @ \$10K/month X 1 month/yr X 3 yrs	\$30,909
(2) Project Staff Manager @ 5K/month x 3 months/yr X 3 yrs	\$46,364
(3) Technician @ \$4K/month X 6 months/yr X 3 yrs	\$74,182
TOTAL PERSONNEL	\$151,454
B. Fringe Benefits	
0% of Salary and Wages	\$0
TOTAL FRINGE BENEFITS	\$0
C. Travel	
Mileage: 104 trips/yr * 30 miles/trip X 3 yrs	\$5,642
TOTAL TRAVEL	\$5,642
D. Equipment	
None	\$0
TOTAL EQUIPMENT	\$0
E. Supplies	
Site Preparation / Installation / Operation Supplies	\$10,366
22 PurpleAir PA-II-SD PM Sensor @ \$279/unit	\$6,138
1 Laptop Computer @ \$1400/unit	\$1400
TOTAL SUPPLIES	\$17,904
F. Other	
Subaward Costs Georgia Tech Research Corporation	\$198,401
Teacher Fellowships @ \$1000/teacher/yr X 10 teachers X 3 yrs	\$30,000
Student Internships @\$250/student/yr X 100 students X 3 yrs	\$75,000
TOTAL OTHER	\$305,000
Indirect Charges	
10% x [Modified Total Direct Costs] = 10% X \$200,000	\$20,000
TOTAL INDIRECT	\$20,000
TOTAL FUNDING and PROJECT COST	\$498,401

B. Reasonableness of Costs

SUMMARY BUDGET ITEMS: Funds are requested for 36 months for costs related to salary and wages; travel; equipment; materials and supplies; participants; one subcontract; and facilities and administration. Salaries and other variable costs are assumed to grow at a rate of 3% per year.

A. PERSONNEL: Program Leader: 1.0 month salary per year for 3 years is requested for the Program Leader, Mr. Garry Harris, President of the Center for Sustainable Communities. Mr. Harris will oversee all program and administrative activities, including allocating budget, installing and operating the enhanced monitoring network, promoting and directing the teacher/community fellowship and student internship programs, coordinating the contributions of the other collaborators at Georgia Tech, and integrating all program components together. He will also work directly to advance the programs' objectives including directing and advising teachers, community partners, and students, collecting and analyzing data, preparing reports, and transferring data and knowledge to interested stakeholders.

Project Manager: 3.0 months salary per year for 3 years is requested for the Project Manager, who will direct the daily administration of the program. This includes purchasing equipment and supplies, directing and scheduling personnel, coordinating all activities, and maintaining records and accounts.

Project Technician: 6.0 months salary per year for 3 years is requested for a Project Technician, who will be responsible for the installation, operation, and maintenance of the sensor network. He/she will assure the data quality by properly following Standard Operating Procedures as described in the *Quality Assurance Plan*, and the timely transfer of data to the publicly accessible database (i.e., purpleair.com) for use by the community and all project partners.

B. FRINGE BENEFITS: As a small community-based non-profit organization, the Center for Sustainable Communities does not provide fringe benefits.

C. TRAVEL: A pool of funds is requested for domestic ground travel in support of project activities. This includes team members using their personal vehicle and being reimbursed at a rate of 58.5 cents per mile. It is estimated that the team will require an average of ~two trips per week to install and maintain the network, to visit partner schools, and to collaborate with other team members at a rate of 30 miles of vehicular travel per trip. No per diem costs are anticipated.

D. EQUIPMENT: None (costs for 22 PM2.5 sensors and a laptop are included in Materials and Supplies).

E. SUPPLIES: Funds are needed each year for materials and supplies related to site preparation, installation, operations, and maintenance of the enhanced air quality monitoring network with highest costs occurring in Year 1 to account for start-up. Additionally, 22 PurpleAir PA-II-SD air quality sensors will be acquired from purpleair.com at a cost of \$279 per sensor, and one project-dedicated PC laptop (\$1400) will be purchased.

F. OTHER DIRECT COSTS: Subcontracts: One subcontract totaling \$198,401 over the 3-year project period will be made to the Georgia Tech Research Corporation (GTRC). \$74,863 of the subaward will fund the efforts of the MAP-USA team members that work at Georgia Tech. The remaining \$123,538 of the subaward will be subsequently passed to the Georgia Tech Applied Research Corporation (GTARC) to fund the efforts of the MAP-USA team members that work at the Georgia Tech Research Institute. (Note: Georgia Tech consists of the traditional university known as "Georgia Tech" and the applied research arm known as the "Georgia Tech Research Institute." For the purposes of MAP-USA, the two entities will operate as a single organization and is referenced throughout this proposal as "Georgia Tech", however the pass through of funds from GTRC to GTARC is required for accounting purposes since the two entities have different cost recovery rates and models.)

For the \$74,863 that will remain in GTRC, \$18,056 is allocated for Sr. Personnel costs for Professors Brewer and Dench for ~1-week equivalent effort per year to ensure the quality of the monitoring data,

advise on the writing of annual reports, and to supervise the PhD student conducting the work. Their time also incurs fringe benefits at a total cost of \$5886 (32.6% of Sr. Personnel costs). The PhD student will be employed for 3 summer months per year at a rate of \$2500/month for 3 years (\$22,500 total). Other direct costs include \$1000 for mileage reimbursements at a rate of 58.5 cents per mile. Modified Total Direct Costs are \$47,442. Indirect costs are calculated at the rate of 57.8% of Modified Total Direct Costs or \$27,421. This rate is based on US EPA as the prime sponsor, and Georgia Tech's Federal Facilities & Administrative (F&A) rate that was established and approved by the Office of Naval Research for fiscal years 2021, 2022 and 2023. Note: Professor Laura Taylor and Dr. Michael Chang will consult and provide advice on air quality monitoring and data analyses at rate of ~1-week per year. Their participation will not incur charges to the project, however.

For the \$123,538 that will pass through to the GTARC, \$41,554 is allocated for Sr. Personnel costs across all three years for Mr. Matthew Swarts (1-week/yr), Ms. Soniya Bhagat (1-week/yr), and a Research Engineer (~3-weeks/yr) to work with the CSC and the teacher fellows to develop the GIS tools and lesson plans. Their work will be coordinated by Mr. Kevin Caravati (~2-days/yr). Their time also includes charges for compensated absences at a rate of 19.76% of personnel costs (\$8211), and fringe benefits at a rate of 29.71% of personnel costs + compensated absences (\$14,785). Overhead on labor is charged at 67.61% of personnel costs + compensated absences + fringe benefits (\$43,642). Materials and Supplies are estimated at \$1000, and a separate overhead charge is assessed on that of 5.79% (\$58). Finally, a General and Administration fee is assessed at a rate of 13.2% on everything except Materials and Supplies (\$14,289).

Participant Costs: Participant costs include stipends to 10 teaching fellows at a rate of \$1000/year. These stipends are to recruit and elicit support for and ownership of the monitors deployed at the schools / in the community, and to incent participation in the community education and awareness programs via the student internship program. Participant costs also include stipends to fund up to 100 students per year (@\$250 per student per year) to serve as interns learning to operate air quality monitors, quality assure the data, and conduct analyses.

G. TOTAL DIRECT COSTS: Sum of costs A-F.

H. INDIRECT COSTS: Facilities and Administrative charges are requested at a rate of 10% of Modified Total Direct Costs (MTDC), consisting of all personnel, fringe, materials and supplies, travel, and the first \$25,000 of the subcontract; but excluding equipment and participant costs.

I. AMOUNT OF THIS REQUEST: Sum of costs G and H. The cumulative 3-year total request is \$498,401.

C. Expenditure of Awarded Funds

Costs for CSC personnel and travel reimbursement will be divided and equally distributed to the recipient during each pay period over the course of each project year. This reflects the demand for recurring involvement in operating a year-round network of continuous air quality monitors. A large fraction of supply expenses will occur within the first 3 months of the project for the purchase of sensors, a laptop, and to prepare sites and install the sensors. The remainder will be available for operations and maintenance costs over the life of the program. Half of the annual participant support costs for the teaching fellows will be paid at the beginning of the yearly fellowship, and the other half upon completion. Student internships will be paid monthly and contingent on student attendance at events. Costs related to the subaward will be invoiced quarterly by the Georgia Tech Research Corporation on a cost-reimbursement basis.

Garry A Harris, ECO District AP

Center for Sustainable Communities
100 Flats Shoals Ave Atlanta, GA 30310

Ex. 6 Personal Privacy (PP)
gharris@csc-atl.org

Experience Related to the Investigation

Garry Harris is the Managing Director for the Center for Sustainable Communities, a community based organization that designs, develops and deploys programs and projects that work to advance the sustainability and resilience of under resourced communities and neighborhoods through a wide variety of technology, science and engineering based solutions based on imperatives of equity, resilience, environmental justice and climate action. The Center for Sustainable Communities successfully deployed nearly seventy (70) community based solutions in 2021 . The Center for Sustainable Communities has also created, advanced and sustained over twelve (12) environmental justice organizations and their associated programs across the nation including the US EPA's Environmental Justice Academy in numerous fields including energy, health, transportation, climate, housing, economic development, gender equality, pollution (air, land and water) among others. The Center for Sustainable Communities has been engaged in the application of community science, education and research efforts through several colleges and universities and government agencies such as EPA, NOAA, FEMA and NASA for nearly a decade and half through a variety of community science and STEM Education programs including JUST Science, GLOBE.gov, My NASA Data and SMART Academy all aimed at mitigating environmental justice and equity challenges and advancing STEM education in under resourced communities through the use of science, engineering and technology. Mr Harris is a visible and engaged leader and participant on a number of local, regional, national equity and environmental justice initiatives that use science, engineering and technology including the Advanced Atmospheric Research and Monitoring and Station (AARMS) NAACP Climate and Energy Justice Leadership Initiative, NAACP Centering Equity in the Sustainable Building Sector Initiative, Justice 40 Climate and Economic Justice Tool (Office and Management and Budget, USDS, US Census Bureau) , Justice 40 Data Science Collaborative (Center for Data Excellence); The Opportunity Project (US Department of Commerce) and Energy Equity Tool Development (Department of Energy/NREL).

Education

BS Nuclear Engineering, University of Virginia, 1981
MS Technology and Operations Management, Southern College of Technology, 1993
MS Quality Systems Engineering, Southern Polytechnic State University, 2003
MS Sustainable Energy and Environmental Management, Georgia Institute of technology August, 2022

Relevant Community, Environmental Leadership Experience

Graduate, 2009 Leadership Atlanta
Graduate, 2013 Institute for Georgia Environmental Leadership;
Graduate, 2014 Regional Leadership Institute
Graduate, 2016 US EPA Environmental Justice Leadership Academy

Relevant Community, Environmental Publications

Co Authored NAACP Guidelines for Equitable Community Involvement in Building Development Projects and Policies, December, 2021; <https://naacp.org/resources/guidelines-equitable-community-involvement-building-development-projects-and-policies>

Positions and Employment

Sustainability Solutions Group and Institute, President and CEO, December , 2021 Present
Center for Sustainable Communities, Managing Director, May 2015-Present
HTS Enterprise, Energy Engineering, President, CEO, September, 1998-Present
US Nuclear Regulatory Commission May 1990-December, 1998
Institute for Nuclear Power Operations May 1998-April, 1990
Westinghouse Electric Corporation, Nuclear Service Division August, 1991 – April 1998

Soniya Bhagat

Ex. 6 Personal Privacy (PP)

U.S. Citizen

EDUCATION

GEORGIA INSTITUTE OF TECHNOLOGY, College of Engineering
Bachelor of Science in Mechanical Engineering
Certificates in Marketing and INTA Scenarios, Models, and Military Games
Candidate for Masters in Sustainable Energy and Environmental Management

Atlanta, Georgia
Spring 2021
Dean's List, GPA: 3.3

EXPERIENCE

Masters in Sustainable Energy and Environmental Management

Atlanta, GA

Masters Student Research

August 2021 - Present

- Produced research memo with a partner studying the potential for hydrogen production in Florida and Georgia.
- Working with a team of students to research the environmental and social impacts of emissions from vehicles utilizing National Energy Modeling System and the Motor Vehicle Emissions Simulator data showcasing emission and energy usages of different vehicle classes and electric vehicles.
- Conducted a life cycle analysis on a system studying the growth production and use of essential oil candles, and impacts of greenhouse gases.
- Research on climate resilience and 'peace engineering' initiatives set forth by the DOD, National Intelligence Agencies, partner universities, etc.

GTRI Patagonia

Patagonia, Chile

Teaching Assistant VIP Program

August 2020 - Present

- Aiding in research of water and energy, transportation, education and communication, waste management, leadership, and business practices in Patagonia to understand the development of a National Parks System.
- Assist, advise, and manage student teams to develop methodology for an implementation of a sustainable and environmentally friendly plan, working alongside the Chilean government.
- Teach students and provide resources on how to utilize and leverage geospatial analysis tools for research projects.

GTRI Aerospace, Transportation, and Advanced Systems Lab

Atlanta, Georgia

Graduate Research Assistant

June 2020 - Present

- Performing geospatial analyses and building models with a focus on environmental, economic, health, infrastructure, and economic data to research solutions for community projects.
- Advance research on red fields to green fields project to explore real estate opportunities in the Atlanta area to promote and sustain the surrounding community, specifically focusing on the environment and economics.
- Collaborate with students at Drexel University to evaluate post war reconstruction efforts in Manbij, Syria and Fallujah, Iraq; utilizing GIS techniques.

Rwanda Sustainable Development

Kigali, Rwanda

PURA Grant, Study Abroad Program

March 2020, August 2020-December 2020

- Identify manufacturing facilities and regions to analyze energy production, land usage, labor population and costs for transportation and raw materials, which will define current capacity and potential areas of development and sustainability for manufacturing facilities leading to greater economic growth.
- Involved in semester-long sustainable development research and learning ArcGIS along with a possible week long trip to Rwanda to meet professionals, and gov. officials to understand context for city planning projects.
- Investigate companies and renewable energy sites in Rwanda as well as study history, culture, and environmental conservation efforts.

Structural Engineering and Materials Lab

Atlanta, Georgia

Student Research Position

March 2019 - May 2020

- Assisting in fabrication and setup of hardware and analysis of various blast mitigation research testing structures.
- Researched testing methods and properties of materials for stress and strain data and self taught ANSYS explicit dynamics in order to model and simulate testing methods.

Modeling, Simulations, Military Gaming

Atlanta, Georgia

Student Team Project

January 2019 - April 2019

- Collaborated with a multidisciplinary graduate level team to research a formulated hypothesis, apply technical knowledge to model, and computationally simulate a historic battle.
- Presented visual simulation, results, and analysis to panel of judges including professionals in industry to understand cumulative effect of minor events on grand outcomes.

Human-Automation Systems Lab

Atlanta, Georgia

Student Researcher

August 2018 - April 2019

- Designed, machined, and fabricated integral structural hardware for research on NAO's influence on children and adults, with cerebral palsy, reaching kinematics in a real-world reaching task.
- Planned a schedule to meet deadlines and manage budget to order needed materials and resources.
- Submitted research to RESNA Student Design Competition 2019.

UROP RWTH Aachen University**Aachen, Germany****Student Researcher***May 2018 - July 2018*

- Researched and designed machine components to aid in the textiles winding process at the ITA department.
- Presented designs in a symposium and submitted a formal report on my research.

Sniffer GPS**Atlanta, Georgia****Start-Up Marketing Intern***March 2018 - April 2018*

- Strategized and developed marketing media for the company.
- Responsible for managing the company's social media presence including Facebook, Snapchat, and Twitter.

GTRI Agricultural Robots**Atlanta, Georgia****VIP Program Research***August 2017 - December 2017*

- Collaborated with a team to design, analyze, fabricate prototypes, and test for implementation of agricultural robots to pick fruits/vegetables in a large-scale farm setting.

Tharpe Engineering**Savannah, Georgia****Structural Engineering Intern***May 2016 - July 2016*

- Implemented an organization and file search program and worked on creating design tables for structural designs.
- Aided in drafting, for basic construction designs as well as designs created by an engineer for current projects.
- Assisted in modeling walls and structures in AutoCAD for a current project on a local building.

LEADERSHIP**Food4Lives NonProfit Organization****Atlanta, Georgia****Lead Volunteer***July 2019 - Present*

- Working with a group of like minded individuals who aim to feed, educate, and support the homeless community.
- Serve others by cooking and feeding for free and providing donated basic necessities such as clothes.
- Managed and organized new volunteers to cook food and prepare to serve within an anticipated schedule.

GT Bhakti Yoga Club**Atlanta, Georgia****President***August 2020 - November 2021*

- Promote mental health awareness by providing students with an outlet to find a community of open minded, welcoming individuals and participate in relaxed physical exercise.
- Manage operations of the yoga club including recruitment and engagement of student members along with maintaining social media and planning classes.
- Circulate information among the members about community yoga events and community service opportunities.

Wreck Racing**Atlanta, Georgia****Project Lead, Secretary & Sponsorship Chair***August 2017 - May 2020*

- Competed and placed in GrassRoots Motorsports Challenge, \$2000 budget car competition in 2017, 2018, 2019.
- Recruited new sponsors and maintained sponsor relationships, managed team members, facilitated training sessions, and recorded notes from SCCGB and leadership meetings for team.
- Worked with leadership team to renovate shop space, upgrade resources, and increase membership by over 50%.
- Leading project on current car to rebuild, recreate panels utilizing fiberglass, paint, and design body with livery.

Grand Challenges Living Learning Community**Atlanta, Georgia****Student Ambassador***August 2018 - May 2020*

- Worked with a multidisciplinary team to investigate and discover real world solutions for a formulated "how might we" question while managing a budget and deadlines.
- Participated in service projects and networked with GT faculty and professors to understand ongoing research.
- Returned following years to engage with younger GC students as an ambassador and participate in events and leadership skills development as retreat leader.

SCC Engage Initiative**Atlanta, Georgia****Founding Member***February 2019 - October 2019*

- Started a discussion and team, along with fellow members, in order to increase diversity/minority inclusion and engagement at the student competition center.
- Collected and evaluated data from current members from various SCC teams utilizing surveys to gauge student perception and areas for improvement.
- Planned and organized a community activities, like the Spring Cookout, to build community and facilitate networking and discussion.

SKILLS/INTERESTS

Software: ArcGIS, NX, ANSYS, SolidWorks, AutoCAD, Revit, MATLAB, Eclipse, Microsoft, Adobe Suite (Photoshop, Illustrator, etc)

Hands-On: Fabrication/Machining: CNC Mill, manual mill and lathe, general machine shop tools, fiberglass

Languages: Gujarati-fluent, Hindi-advanced, Spanish-intermediate, French-beginner, German-beginner

Interests: Visual Arts: graphics, photography, ceramic and pottery, sculptures, drawing, 2-D design; Yoga

NSF BIOGRAPHICAL SKETCH

NAME:	Brewer, Dylan
POSITION, TITLE, & INSTITUTION:	Assistant Professor, School of Economics, Georgia Institute of Technology

A. PROFESSIONAL PREPARATION

INSTITUTION	LOCATION	MAJOR/AREA OF STUDY	DEGREE	YEAR
Michigan State University	East Lansing, Michigan	Economics	PHD	2019
Michigan State University	East Lansing, Michigan	Economics	MA	2016
University of Virginia	Charlottesville, Virginia	Economics, Foreign Affairs	BA	2014

B. APPOINTMENTS

From - To	Position Title, Organization and Location
2019 – present	Assistant Professor, School of Economics, Georgia Institute of Technology, Atlanta, Georgia

C. PRODUCTS

Strategic Energy Institute Grant, “The Effects of Internal Combustion Engine Transit Systems on Health: An Interdisciplinary Research Program Linking Transit-Related Pollution to Birth Outcomes,” (2021). Principle investigator. Co PI: Randall Guensler.

Georgia Tech EVPR Seed Grant, “The Health Effects of Air Pollution: An Interdisciplinary Research Program,” (2021). Collaborator. PIs: Randall Guensler and Laura Taylor.

Brewer, Dylan. “Do preferred thermostat settings differ by sex?” (2020). *Energy and Buildings*, vol. 224.

“Equilibrium Sorting and Moral Hazard in Residential Energy Markets.” Forthcoming, *Journal of Urban Economics*, May 2022.

“The Economic Costs of Forecasting Errors in the PJM Interconnection Due to the COVID-19 Quarantine.” *IAEE Energy Forum*, Covid-19 Special Issue 2020: 116-119.

“Household Responses to Winter Heating Costs: The Remarkably Inelastic Demand for Space Heating.” *Working paper*.

“Changes in electricity use following COVID-19 stay-at-home behavior.” *Working paper*.

“Addressing Sample Selection Bias for Machine Learning Methods.” Joint with Alyssa Carlson. *Working paper*.

“Who Heeds the Call in an Energy Emergency? Evidence from Smart Thermostat Data.” Joint with Jim Crozier. *Working paper*.

D. SYNERGISTIC ACTIVITIES

Trustee, Board of Trustees for The Nature Conservancy of Michigan, 2018-2020.

Ivan Allen College of Liberal Arts 2021 Distinguished Tenure-Track Faculty Teaching Award.

9x Center for Teaching and Learning “Thank-A-Teacher” Notes 2020-2022.

Runner up for SLS Faculty Sustainable Communities Teaching Awards, 2021: People’s Choice.

Student Recognition of Excellence in Teaching: Class of 1934 CIOS Honor Roll, 2020.

Class of 1969 Teaching Fellowship, Georgia Institute of Technology, 2020-2021.

Serve-Learn-Sustain Toolkit Grant, Georgia Institute of Technology, 2019-2020.

Faculty affiliate of the Strategic Energy Institute and Serve-Learn-Sustain.

Co-organizer of the Southeastern Energy and Environmental Economics Workshop at Georgia Tech.

BIOGRAPHICAL SKETCH

Kevin C. Caravati

NAME Caravati, Kevin C.	POSITION TITLE Principal Research Scientist Georgia Tech Research Institute
404-407-8058; kevin.caravati@gtri.gatech.edu 75 5 th Street NW Atlanta GA	

Education and Training

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Dayton, OH	BS	1984	Geology
University of South Florida, Tampa, FL	MS	1989	Geology/Hydrogeology track
Mercer University, Atlanta, GA	MBA	1999	International Business

Positions and Appointments

2016-present	Principal Research Scientist, GTRI Energy & Sustainability Manager
2003-2016	Senior Research Scientist/Branch Head, Georgia Tech Research Institute, Atlanta, GA
2002-2003	Manager, Industrial and Federal Programs, MWH Global, Atlanta, GA.
1990-2002	Technical Director, Weston Solutions, Atlanta, GA
1985-1990	Project Manager, Geraghty & Miller, Inc., Tampa, FL

Products/Publications

Peace Engineering-GTRI Peace Engineering Response Center, 2020-present
Renewable Energy System for the Kennedy Space Center Visitor Complex (installed April 2018).

Technology licenses and installed solar PV prototypes; Georgia World Congress Center, Agnes Scott College, Ponce City Market

Strategic Plan for Sustainability, Yellowstone National Park (2009-2017).
<https://www.nps.gov/yell/getinvolved/sustainability-contents.htm>

Goodman, J., K. Caravati, A. Foote, M. Nelson, E. Woods. 2013. System Life Cycle Evaluation (SLiCE): Harmonizing water treatment systems with implementer's needs.

Caravati, K., Z.A. Seymour, and J.B. Hughes. Submitted 2008. The National Academies Institute of Medicine; Civil Infrastructure for Water, Sanitation, and Improved Health: Existing Technology, Barriers, and Need for Innovation.

Hughes, J.B., H. Fritz., and K. Caravati. 2007. Restoration Plan for the Cacongo Region Mangrove Lagoon, Cabinda, Angola. Georgia Institute of Technology.

Synergistic Activities

- Innovation Center for Research in Energy Systems and Technologies (ICREST), co-Founder
 - Georgia Tech Innovation Ecosystem Executive Committee, 2021-present
 - State of Georgia, Pandemic Preparedness & Prevention, 2020-present
 - Sustainability Next-Innovation Ecosystem Committee, 2020-2021
 - Bill & Melinda Gates Foundation, GTRI Program Manager, 2018-2019
 - Brook Byers Institute for Sustainable Systems, Fellow, 2015-2021
 - Vertically Integrated Projects-MARS, Sustainable Parks, Peace Engineering 2016-present
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- Program Manager- Georgia Energy, Sustainability and Health and Safety Research; 2009-present
 - Task Leader-Dept. of Energy Center for Grid Eng. Education, K12 solar integration; 2014-2018
 - Program Manager-SunShot Initiative SIMPLE BOS 2011-2015
 - Project ENGAGES (URM high school mentorship program) Engineering Manager (2014-2018)
 - Principal Investigator, National Park Service-Yellowstone National Park Environmental Stewardship Intern Program, 2007-2018; energy efficiency and sustainability program as a showcase for the US Department of Interior.
 - US EPA Project Manager-1989-1999; managed environmental assessment and remediation programs at EPA Region IV Superfund sites in the Southeast.

NSF BIOGRAPHICAL SKETCH

NAME: Chang, Michael

ORCID: 0000-0001-7226-9736

POSITION TITLE & INSTITUTION: Deputy Director, Brook Byers Institute for Sustainable Systems

(a) PROFESSIONAL PREPARATION -(see PAPPG Chapter II.C.2.f.(a))

INSTITUTION	LOCATION	MAJOR / AREA OF STUDY	DEGREE (if applicable)	YEAR YYYY
Georgia Institute of Technology	Atlanta, Georgia	Aerospace Engineering	BENG	1987
Georgia Institute of Technology	Atlanta, Georgia	Earth and Atmospheric Science	MS	1992
Georgia Institute of Technology	Atlanta, Georgia	Public Policy	MS	1997
Georgia Institute of Technology	Atlanta, Georgia	Earth and Atmospheric Science	PHD	1997

(b) APPOINTMENTS -(see PAPPG Chapter II.C.2.f.(b))

2009 - present Deputy Director, Brook Byers Institute for Sustainable Systems, Georgia Institute of Technology, Atlanta, GA

1992 - 2009 Research Scientist, School of Earth & Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA

1992 - 1998 Air Quality Modeler, Air Protection Branch, Georgia Environmental Protection Division, Atlanta, GA

1990 - 1992 Graduate Research Assistant, School of Earth & Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA

1988 - 1990 Engineer/Scientist, McDonnell Douglas Corporation, Long Beach, CA

(c) PRODUCTS -(see PAPPG Chapter II.C.2.f.(c))

Products Most Closely Related to the Proposed Project

1. Chang ME, Cardelino C. Application of the Urban Airshed Model to forecasting next-day peak ozone concentrations in Atlanta, Georgia. J Air Waste Manag Assoc. 2000 Nov;50(11):2010-24. PubMed PMID: [11111345](#).
2. Hu Y, Odman MT, Chang ME, Jackson W, Lee S, Edgerton ES, Baumann K, Russell AG. Simulation of air quality impacts from prescribed fires on an urban area. Environ Sci Technol. 2008 May 15;42(10):3676-82. PubMed PMID: [18546707](#).
3. Di T, Cohan DS, Napelenok S, Bergin M, Hu Y, Chang M, Russell AG. Uncertainty analysis of ozone formation and response to emission controls using higher-order sensitivities. J Air Waste Manag Assoc. 2010 Jul;60(7):797-804. PubMed PMID: [20681427](#).
4. Chang ME. Strategic Air Quality Planning in the Context of Sustainability. Atmospheric Environment. 2000; 34:2495.
5. Odman MT, Huang R, Pophale AA, Sakhpara RD, Hu Y, Russell AG, Chang ME. Forecasting the Impacts of Prescribed Fires for Dynamic Air Quality Management. Atmosphere. 2018;

Other Significant Products, Whether or Not Related to the Proposed Project

1. Weber R, Bergin M, Kiang CS, Chameides W, Orsini D, St JJ, Chang M, Bergin M, Carrico C, Lee YN, Dasgupta P, Slanina J, Turpin B, Edgerton E, Hering S, Allen G, Solomon P. Short-term temporal variation in PM_{2.5} mass and chemical composition during the Atlanta Supersite Experiment, 1999. *J Air Waste Manag Assoc.* 2003 Jan;53(1):84-91. PubMed PMID: [12568257](#).
2. Unal A, Hu Y, Chang ME, Odman MT, Russell AG. Airport related emissions and impacts on air quality: Application to the Atlanta International Airport. *Atmospheric Environment.* 2005; 39(32):5787.
3. Maxwell-Meier KL, Chang ME. Comparison of ozone temporal scales for large urban, small urban, and rural areas in Georgia. *J Air Waste Manag Assoc.* 2005 Oct;55(10):1498-507. PubMed PMID: [16295275](#).
4. Hu Y, Chang ME, Russell AG, Odman MT. Using synoptic classification to evaluate an operational air quality forecasting system in Atlanta. *Atmospheric Pollution.* 2010; 1:280.
5. Hu Y, Odman MT, Chang ME, Russell AG. Operational forecasting of source impacts for dynamic air quality management. *Atmospheric Environment.* 2015; 116:320. DOI: 10.1016/j.atmosenv.2015.04.061

(d) SYNERGISTIC ACTIVITIES -(see PAPPG Chapter II.C.2.f.(d))

1. Principal Investigator for Georgia Air Quality Forecasting (1996-present) - In partnership with the Georgia EPD, Chang leads a team of air quality specialists in the daily forecasting of ozone and PM_{2.5} air quality in the Atlanta, Macon, and Columbus, Georgia metropolitan areas.
2. Principal Investigator for the Fall Line Air Quality Study (FAQS) - FAQS was a \$3M, 3-year study (2000-2003) commissioned by the Georgia General Assembly to investigate the causes and potential solutions for poor air quality in the Augusta, Macon, and Columbus, Georgia metropolitan areas. The study consisted of intensive monitoring of ozone and particle pollutants, photochemical grid modeling, and assessment of policy options.
3. Principal Investigator for Scoping an air quality forecasting program for the Mon Valley on behalf of the Allegheny County (PA) Health Department (2021-2022) - Chang leads a team of investigators from Georgia Tech that has been consulting with the ACHD on the development of an air quality forecasting program to predict 24-48 hour future concentrations of PM_{2.5} in the Monongahela Valley near Pittsburgh, PA.
4. Founding Editor-in-Chief, *Elementa, Science of the Anthropocene* (Sustainable Engineering Knowledge Domain, 2012-2018). *Elementa* publishes original research reporting on new knowledge of the Earth's physical, chemical, and biological systems; interactions between human and natural systems; and steps that can be taken to mitigate and adapt to global change.
5. Science Advisory Board Member, US Department of Defense, Strategic Environmental Research and Development Program, Defense Coastal Estuarine Research Program Advisory Board (2006-2013). DCERP demonstrated the science behind integrated ecosystem-based management at Marine Corps Base Camp LeJeune, NC.

NSF BIOGRAPHICAL SKETCH

NAME:	Dench, Daniel
POSITION, TITLE, & INSTITUTION:	Assistant Professor, School of Economics, Georgia Institute of Technology

A. PROFESSIONAL PREPARATION

INSTITUTION	LOCATION	MAJOR/AREA OF STUDY	DEGREE	YEAR
The Graduate Center, CUNY	New York, New York	Economics	PHD	2020
Temple University	Philadelphia, Pennsylvania	Economics	BA	2011

B. APPOINTMENTS

From - To	Position Title, Organization and Location
2020 – present	Assistant Professor, School of Economics, Georgia Institute of Technology, Atlanta, Georgia

C. PRODUCTS

Dench, D., Joyce, T., Minkoff, H. (2022) U.S. Preterm Birth Rate and Covid-19. Pediatrics, available online first at: <https://doi.org/10.1542/peds.2021-055495>

Dench, D., & Joyce, T. (2022) Information and credible sanctions in curbing online cheating among undergraduates: a field experiment. Journal of Economic Behavior & Organization, 195:408-427

Ali, F.R.M, Dave, D. M., Colman, G.J., Wang, Xu, Saffer, H., Marynak, K.L., Dench, D., Grossman, M. (2021). Association of e-cigarette advertising with e-cigarette and cigarette use among US adults. Addiction, 116,(5): 1212-1223

Dave, D. M., Dench, D., Kenkel, D. S., Mathios, A., & Wang, H. (2020). News that takes your breath away: Risk perceptions during an outbreak of vaping-related lung injuries. Journal of Risk and Uncertainty, 60(3): 281–307

Saffer, H., Dench, D., Dave, D. M., & Grossman, M. (2020). E-cigarettes and adult smoking: evidence from Minnesota. Journal of Risk and Uncertainty, 60 (3): 207–228

Dench, D., & Joyce, T. (2020). Income, the earned income tax credit, and infant health revisited. Health Economics, 29(1): 72-84

Dave, D. M., Dench, D., Grossman, M., Kenkel, D. S., & Saffer, H. (2019). Does e-cigarette advertising encourage adult smokers to quit? *Journal of Health Economics*, 68: Article 102227

Zheng, Y., Zhen, C., Dench, D., & Nonnemaker, J. M (2016) Advertising, habit formation, and US tobacco product demand. *American Journal of Agricultural Economics*, 98 (4):1038-1054.

Gammon, D. G., Loomis, B. R., Dench, D., King, B., Fulmer, E. B., & Rogers, T. (2016). National and state-specific sales and prices for electronic cigarettes—US, 2012-2013 *American Journal of Preventive Medicine*, 50(1): 18-29.

Gammon, D. G., Loomis, B. R., Dench, D., King, B., Fulmer, E. B., & Rogers, T. (2015). Effect of price changes in little cigars and cigarettes on little cigar sales: USA, Q4 2011–Q4 2013. *Tobacco Control*, 25(5): 538-544.

Nonnemaker, J. M., Dench, D., Homsy, G., MacMonegle, A., & Duke, J. (2015). The effect of exposure to media campaign messages on adult cessation. *Addictive Behaviors*: 49: 13-19.

Kim, A. E., Lieberman, A. J., & Dench, D. (2014). Crowdsourcing data collection of the retail tobacco environment: Case study comparing data from crowdsourced workers to trained data collectors. *Tobacco control*, 24(e1): e6-e9.

Schmitt, C. L., Juster, H., Dench, D. L., Willett, J., & Curry, L. E. (2013). Public and policy maker support for point-of-sale tobacco policies in New York. *American Journal of Health Promotion*: 28(3): 175–180.

Nonnemaker, J. M., Ashley, O. S., Farrelly, M. C., & Dench, D. L. (2012). Parent-child communication and marijuana initiation: Evidence using discrete-time survival analysis. *Addictive Behaviors*, 37(12), 1342–1348.q1

D. SYNERGISTIC ACTIVITIES

Wheeler Magnet School Mentor, Spring 2021.

3x Center for Teaching and Learning “Thank-A-Teacher” Notes 2020-2022.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.

Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Swarts, Matthew Ernest

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Senior Research Scientist

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Georgia Institute of Technology	B.S.	06/2006	Architecture
Georgia Institute of Technology	M.S.	12/2011	Architecture

A. Personal Statement

I am a Senior Research Faculty member at the Georgia Tech Research Institute (GTRI) in Atlanta, Georgia. I head the Machine Learning & Data Analytics (MLDA) Branch in the Intelligent Sustainable Technologies Division (ISTD) of the Aerospace, Transportation & Advanced Systems Laboratory (ATAS). My work focuses on the translation of human behavioral patterns and perceptions within real and virtual environments into computer models and simulations to better understand spatial design decisions. I develop custom hardware sensors, interactive systems, and software applications for capturing occupant behavior, testing human spatial perception in 3D virtual environments, running discrete-event and agent-based modeling and simulation, and performing spatial analysis in the intersections between Building Information Modeling and Geographic Information Systems.

1. Gómez, P., Hadi, K., Swarts, M., Kemenova, O., Bernal, M. (2021). "Spatiotemporal Modeling of COVID-19 Spread in Educational Environments." Emerald Publications (in review).
2. Gómez, P., Hadi, K., Kemenova, O., Swarts, M. (2020). "Spatiotemporal Modeling of COVID-19 Spread in Built Environments." SIGraDi 2020, Medellin, Colombia.
3. Hadi, K., Gómez, P., Swarts, M., Marshall, T., Bernal, M. (2020). "Healthcare Design Metrics for Human-Centric Building Analytics." SIGraDi 2020, Medellin, Colombia.

B. Positions and Honors**Positions and Employment**

2020-Present Machine Learning and Data Analytics Branch Head, GTRI, Atlanta, GA
 2018-Present Senior Research Scientist, Georgia Tech Research Institute, Atlanta, GA
 2017-2018 Senior Research Scientist, Georgia Institute of Technology, Atlanta, GA
 2013-2017 Research Scientist II, Georgia Institute of Technology, Atlanta, GA
 2006-2013 Research Scientist I, Georgia Institute of Technology, Atlanta, GA
 2001-2006 Student Research Assistant, Georgia Institute of Technology, Atlanta, GA

Other Experience and Professional Memberships

Honors

2021	ITEEA Presidential Citation
2017	FORUM8 Academic Encouragement Award
2008	Research Service Award in the Georgia Tech College of Architecture 2008 Awards Ceremony

C. Contribution to Science

1. Most of my publications demonstrate work developing notions of human spatial experience through electronic hardware development and evaluation, software algorithm development, and data analysis of wide area sensor networks
2.
 - a. Gómez, P. & Swarts, M. (2014). Campus Information-and-knowledge Modeling: Embedding Multidisciplinary Knowledge into a Design Environment for UniversityCampus Planning. International Journal of Architectural Computing, vol. 12, no. 4, pp. 439-458. Doi: 10.1260/14780771.12.4.439
 - b. Afsari, K., Swarts, M., & Gentry, T.R. (2014). "Integrated Generative Technique for Interactive Design of Brickworks", Journal of Information Technology in Construction. Vol.19, Special Issue Emerging digital technologies and innovations, pp. 225-247.
 - c. Wonoto, N., Baerlecken, D., Gentry, T.R., & Swarts, M. (2013). "Parametric Design and Structural Analysis of Deployable Origami Tessellation", Computer-Aided Design & Applications, 10(6), 939-951. doi: 10.3722/cadaps.2013.939-951
 - d. Economou, A. & Swarts, M., "Performing Palladio", International Journal of Architectural Computing, vol. 4, no. 3, pp. 47-61, 2006.

Complete List of Published Work in MyBibliography:

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

Completed Research Support

NSF BIOGRAPHICAL SKETCH

NAME:	Taylor, Laura
POSITION, TITLE, & INSTITUTION:	Professor and Chair, School of Economics, Georgia Institute of Technology

A. PROFESSIONAL PREPARATION

INSTITUTION	LOCATION	MAJOR/AREA OF STUDY	DEGREE	YEAR
University of North Carolina, Asheville	Asheville, N.C.	Economics	BA	1987
Duke University	Durham, N.C.	Economics	MA	1990
North Carolina State University	Raleigh, N.C.	Economics	PHD	1995

B. APPOINTMENTS

From - To	Position Title, Organization and Location
2018 – present	Professor and Chair, School of Economics, Georgia Institute of Technology, Atlanta, Georgia
2007 – 2018	Professor, Dept of Agricultural and Resource Economics and Director, Center for Environmental and Resource Economic Policy, North Carolina State University, Raleigh, NC
2001 – 2005	Associate Director, Environmental Policy Program, Department of Economics, Georgia State University
1994 – 2007	Assistant Professor (1994-2001), Associate Professor (2001-2007), Department of Economics, Georgia State University, Atlanta, Georgia

C. PRODUCTS

Most closely related (up to five)

Brown, M, Beasley, B., Fikret, A., Cobb, K., Dwiveldi, P., Hubbs, J., Iwanick, D., Mani, S., Matisoff, D., Mohan, J., Mullen, J., Oxman, M., Rochberg, D., Rodgers, M., Shephard, M., Simmons, R., Taylor, L., Toktay, B. (2021). “Translating a Global Emission-Reduction Framework for Subnational Climate Action: A Case Study from the State of Georgia,” *Environmental Management*, 67:205-227.

“Revealed Preference Methods for Estimating the Value of Reduced Mortality Risks: Contemporary Guidance for the Hedonic Wage Model” (with Mary Evans), *Review of Environmental Economics and Policy*, 14(2): 739-769, 2020.

Lutzeyer, S., Taylor, L., Phaneuf, P. (2018). The Amenity Costs of Offshore Wind Farms: Evidence from a Choice Experiment, *Energy Economics*, 72: 621-639.

Wichman, C., Taylor, L., and Von Haefen, R. (2016). Conservation Policies: Who Responds to Price and Who Responds to Prescription?, *Journal of Environmental Economics and Management*, 76: 114-134.

Benneer, L., Lee, J., Taylor, L. 2013. Municipal Rebate Programs for Environmental Retrofits: An Evaluation of Additionality and Cost-Effectiveness, *Journal of Policy Analysis and Management*, 32(2): 350-372.

Other Significant (up to five)

Lee, J., Taylor, L., Berglund, E. (2021). “Water Use in the Landscape: A Comparison of Irrigation Technologies and Water Quality on Behavior” (with Jonathan M. Lee* and Emily Z. Berglund), *Water Resources Research*, 57(10).

Lee, J. and Taylor, L. (2019). “Randomized Safety Inspections and Risk Exposure on the Job: Quasi-experimental Estimates of the Value of a Statistical Life,” *American Economic Journal: Economic Policy*, 11(4):350-374.

“Disentangling the Property Value Impacts of Environmental Contamination from Locally Undesirable Land Uses: Implications for Measuring Post-Cleanup Stigma” (with Daniel Phaneuf and Xiangping Liu*), *Journal of Urban Economics*, 93: 85-98, 2016.

Phaneuf, D., Taylor, L., Braden, J. (2013). Combining Revealed and Stated Preference Data to Estimate Preferences for Residential Amenities: A GMM Approach, *Land Economics*, 89(1): 30-52.

D. SYNERGISTIC ACTIVITIES (up to five examples)

Board of Directors, Society for Benefit Cost Analysis, 2020 - 2022.

Editorial Committee, Annual Review of Resource Economics, 2018-2023.

President, Association of Environmental and Resource Economists, 2017 - 2018.

North Carolina Sea Grant, Advisory Board, 2014 - 2018.

U.S. Environmental Protection Agency, Science Advisory Board, Environmental Economics Advisory Committee (standing committee), 2006 - 2012.